

UNIVERSITY OF KWAZULU-NATAL

**ESSAYS ON COLLUSION IN SOUTH AFRICA'S
GRAIN INDUSTRY: REMEDIES, OVERCHARGES
AND CARTEL STABILITY**

A PhD Dissertation

By

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Declaration

ILiberty Mncube.....declare that

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Lolu newaningo ngilwethula ngenkulu inhlonipho kubazali bami ikakhulu ugogo umaNdlovu ongodlile kanye nomama okaMabuza. Ngibonga kakhulu kubona ukungikhulisa nokungifundisa kwabo ngesineke. Kepha konke lokhu kimina kwakuyoba yiphupho eliluvindi elingafezekile ukuba bekungekho ukumiswa idolu umkami.

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Okokugcina ngithanda ukubonga uNkulunkulu wami.

ABSTRACT

The rule against collusion is the least controversial prohibition in competition law and is regarded with approval even by those generally sceptical of government interventions in markets. Nonetheless, some significant and challenging questions remain unanswered. For example, there is far less consensus than is apparent on the empirical evidence concerning (1) a cartel's actual effects; (2) the detection of cartels; and (3) the effect of cartel remedies. This least controversial area of competition policy may very well be one for which there is in fact limited consensus.

This dissertation explores these issues in the context of the South African grain industry. It is a collection of related essays on collusion following various competition policy interventions in the recent past. Essay one analyses the South African flour cartel, active from 1999 to 2007 and provides an overcharge estimation by applying comparator based methods. In Essay two, I examine the extent of market power in the flour industry. I ask whether observed prices and quantities in the flour industry reflect switching from collusive to non-collusive behaviour and test for this empirically.

Essay three explores the strategic behaviour adopted by the cartel and in particular attempts by Pioneer Foods to create artificial barriers to entry. This essay focuses on the following questions. How did Pioneer Foods and the bread cartel respond to entry? How effective was Pioneer Foods' conduct in maintaining collusion under the threat of entry? Essay four critically discusses the use of remedies in pursuing distributive justice through the restoration of competition, through deterrence, and through disgorgement of profits. More specifically, the design and objectives of the Pioneer Foods settlement agreement are examined. For some, the competition law remedies and in particular the discount remedy that was adopted, following confirmation by the Competition Tribunal, constitute a key measure of 'success' for the case. Essay five evaluates this claim by examining the design and effectiveness of the discount remedy from a comparative perspective.

In each essay (albeit to varying degrees), the study will evaluate both the theoretical and empirical issues involved. To improve our understanding of competition policy and its administration, economic understanding will be joined with appreciation for case specific issues and the South African legal framework.

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I. INTRODUCTION

Competition policy plays a prominent role in ensuring that competition in the marketplace is not restricted in a way that is detrimental to society. The focus of competition policy is on maintaining rules of competition that enable rivalry among firms to produce certain market outcomes. One such rule prohibits firms from entering into agreements not to compete with one another.

The rule against collusion is the least controversial prohibition in competition law and is regarded with approval even by those generally sceptical of government interventions in markets. Nonetheless, some significant and challenging questions remain unanswered. For example, there is far less consensus than is apparent on the empirical evidence concerning a cartel's actual effects. This apparently least controversial area of competition policy may very well be one for which there is in fact limited consensus.

What follows below is an introductory overview of the main issues and not a comprehensive review of a vast literature on collusion generally. In the remainder of this overview chapter, I first set out the legal framework in regard to collusion before turning to a review of the economics of collusion. That review is intended to introduce the key issues and does not examine all facets of what is a vast economic literature on oligopoly and collusion. There then follows an introduction to the South African grain industry and a brief overview of the essays that comprise the core of this thesis.

1. The law on collusion in South Africa

The prohibition on restrictive horizontal practices is found in section 4 of the Competition Act, 89 of 1998 as amended (henceforth "Competition Act"). Section 4 reads as follows:

"4 (1) An agreement between, or a concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship¹ and if–

(a) it has the effect of substantially preventing, or lessening, competition in a market, unless a party to the agreement, concerted practice, or decision can prove that any

¹ The Competition Act defines "horizontal relationship" as "a relationship between competitors" (Section 1 of the Competition Act).

technological, efficiency or other pro-competitive gain resulting from it outweighs that effect; or

(b) it involves any of the following restrictive horizontal practices:

- (i) directly or indirectly fixing a purchase or selling price or any other trading condition;
- (ii) dividing markets by allocating customers, suppliers, territories, or specific types of goods or services; or
- (iii) collusive tendering.”

The legal prohibitions on collusion are triggered by certain types of conduct rather than by outcomes themselves. For example, the legal question is whether the conduct of firms in relation to price and other trading conditions is a result of an agreement. If not, there is no violation. If so, there is a violation. What then is an agreement or concerted practice? The Competition Act defines an agreement “in relation to a prohibited practice, to include a contract, arrangement or understanding, whether or not it is legally enforceable”.² A concerted practice arises from “cooperative or coordinated conduct between firms, achieved through direct or indirect contact that replaces their independent action but which does not amount to an agreement”.³ Therefore, a concerted practice may *inter alia* arise out of coordination which becomes evident from the conduct of firms in the market. The idea that a concerted practice may be inferred from behaviour might seem to suggest, at first glance, that interdependent oligopoly behaviour is prohibited. However, oligopoly behaviour does not establish a concerted practice unless, given the nature of the market, the behaviour of the firms concerned cannot be explained other than by concerted behaviour.

Like elsewhere around the world, a short summary of South African competition law on collusion always reads “collusion is per se illegal”. In other words, the mere occurrence of the conduct will attract liability. Although the conduct cannot be justified, it does have to be established that the conduct has occurred. The per se rule contrasts with the effects based approach adopted in other areas of competition law, in which the benefits and costs of a particular course of conduct are weighed explicitly. Put differently, the seemingly straightforward prohibition of cartel behaviour hides a complex reality. This complexity is both legal and economic in nature. For instance, on the economic side lies the fact that nearly every cartel member will be ready to offer a reason why their particular cartel arrangement is good for society. For instance, one such argument is that in

² See Section 1 (ii) of the Competition Act.

³ See Section 1 (vi) of the Competition Act.

the absence of an agreement, firms would engage in ruinous competition which would ultimately lead to higher prices and a monopoly outcome.

Firms found guilty of collusion are subject to an administrative penalty of up to 10 per cent of the firm's annual turnover in South Africa in the preceding financial year.⁴ Administrative penalties are fines. Their purpose is not to punish firms found in violation of the Competition Act but to deter them from engaging in certain conduct. If a firm has contravened the Competition Act, then the following factors must be considered when determining the level of the fine: (1) the nature, duration, gravity and extent of the contravention; (2) any loss or damage suffered as a result of the contravention; (3) the behaviour of the cartel; (4) the market circumstances in which the contravention took place; (5) the level of profit derived from the contravention; (6) the degree to which the cartel has co-operated with the Competition Commission ("Commission") and the Tribunal; and (7) whether the cartel member has previously been found in contravention of this Act. Therefore there is a link between the damage caused by the cartel and profits which accrue from the cartel activity.

The Competition Amendment Act which was adopted and assented to, in 2009, introduces criminal sanctions for individuals involved in cartel conduct.⁵ The Competition Amendment Act provides for directors or persons in a position of management authority who cause their firms to participate in cartel conduct to be liable to a fine of up to R500 000 or imprisonment not exceeding 10 years, or both.⁶ The Competition Amendment Act provides that it will come into operation on a date to be fixed by the President of South Africa by proclamation in the Government Gazette. To date, the Competition Amendment Act has not yet entered into force.⁷

⁴ The US Sentencing Guidelines recommend a base fine of 10% of the affected volume of commerce to a firm found guilty of collusion. To this base fine, another 10 per cent is added for the harm inflicted upon consumers who are unable or for other reasons do not buy the product at the elevated price. This results in a fine of 20 per cent that may also undergo some adjustments for aggravating and mitigating factors. In the EU, the total fine does not exceed the 10 per cent of the overall turnover or global sales of the firm.

⁵ Competition Amendment Act (No. 1 of 2009), Government Gazette No. 32533, Notice 875, of 28 August 2009.

⁶ Competition Amendment Act (2009), Government Gazette No. 32533, Notice 875, of 28 August 2009, section 13.

⁷ South Africa will be joining the growing number of countries that have opted to criminalise cartel conduct, including the US, Canada, Japan, Ireland and the UK. There is an increasing consensus among competition authorities that the threat of imprisonment for individuals is the best deterrent for cartel conduct, over and above administrative penalties.

2. The economics of collusion

A. OLIGOPOLY THEORY⁸

The basic theoretical framework used to study collusion is that of dynamic or repeated oligopoly.⁹ This framework focuses on whether firms have incentives to cheat by undercutting oligopoly prices. This is because individual firm profits may be maximised by cheating. The framework also shows how price wars may occur even when no firm has cheated as a result of uncertainty. The seminal article on oligopoly theory is by Friedman (1971). For a survey on modern game theory in general see Fudenberg and Tirole (1991). Tirole (1988) and Vives (1999) offer valuable insights on the application of game theory to oligopoly, while Whinston (2006) and Kaplow and Shapiro (2007) provide an extensive discussion on the connection between oligopoly theory and competition policy.

It is important to note from the outset that oligopoly theory does not directly distinguish between successful oligopolistic behaviour which results in supra-competitive pricing because of recognized interdependence¹⁰ and cartel behaviour wherein firms meet secretly to fix prices and allocate markets or various cases in between. Unlike competition law, oligopoly theory does not require an agreement but has a concept (whether the strategies of firms constitute an equilibrium) which is closely related to the idea of an agreement.¹¹ In game theory the equilibrium concept refers to a situation in which, taking as given the other firms' strategies, no firm can gain by deviating from its own strategy. While the concept of equilibrium is not equivalent to the agreement requirement, it is the only concept in oligopoly theory that relates to the notion of an agreement.¹²

This observation is important because competition law in South Africa strongly embraces economics or compatibility with economic learning, both for understanding firm behaviour in particular cases and for administering legal rules. Oligopoly theory not only offers a sound analytical foundation but also a framework for explaining and predicting oligopoly behaviour in

⁸ The following discussion is limited to price fixing. However, the analytical framework is generally applicable to allocating markets.

⁹ This corresponds to situations in which oligopolistic firms in a particular product market interact together over time.

¹⁰ Firms do not undercut each other's prices because of an expectation of retaliation. This retaliation is derived from a common appreciation of each firm's circumstances.

¹¹ Kaplow (2011) explores the relationship between the concept of equilibrium with the requirement of an agreement in greater detail.

¹² Equating equilibrium with agreement comes with its own problems. For instance, in any equilibrium of a non-cooperative game, including one relating to a cartel, each firm behaves in its own interest, taking as given its expectation of reactions of other firms. Furthermore, one equilibrium in a repeated game involves firms charging at marginal cost indefinitely. Although this equilibrium could be viewed as a nonbinding agreement, we would not want to suggest that this is illegal under competition law. Put differently, a firm can decide that it will price at marginal cost no matter what other firms do. The outcome will involve an equilibrium in which each firm behaves independently and therefore does not require a meeting of minds.

real markets. Repeated games capture the strategic interactions that make successful coordinated oligopoly pricing possible. For example, in a one-period pricing game between two symmetric firms that sell homogenous products and each produce at the same constant marginal cost, the competitive price would accordingly be equal to marginal cost. Suppose further that the firms jointly profit-maximize when price is equal to the monopoly price. Assume that if one firm charges the lowest price that firm will capture all the sales, whereas if the two firms charge the same price, they will divide the sales equally between them. If each firm prices at the competitive price, this would result in the only equilibrium of this one-shot game. Be that as it may, evidence from some markets shows that sometimes firms are able to charge supra-competitive prices. In fact, successful collusion has been observed in a variety of other settings in which the one-period pricing game logic discussed above would suggest that it is impossible.

Suppose now the game is repeated infinity. At the industry-profit-maximizing price, assumed to be the monopoly price, no firm will wish to cut its price to gain market share if it expects this act to induce its rivals to cut price as well, perhaps matching the first firm's lower price (following a tit-for-tat strategy) and perhaps undercutting it. The price cutting firm will be worse off whether the price is slightly lower than the monopoly price or all near the competitive price. Therefore, as long as the price cutting firm does not expect to profit sufficiently in the short run to make up for the loss in the long run, it will adhere to the monopoly price. It is important to note that this logic is equally applicable regardless of whether each firm's expectation about the responses from other firms arises from their mutual appreciation of their common situation or as a consequence of direct agreement of the matter.

Similarly, a firm may be willing to increase its price, say from a competitive price or from some intermediate level, to the monopoly price if it anticipates (again, whether by conjecture or as a result of explicit dialogue) that its rivals will do the same. In other words, it expects its rivals to reciprocate. If its rivals respond by matching the price increase, the firms will all be better off thereafter and the price increase can be sustained. This outcome will hold as long as the first firm does not lose much profit as a first mover while others delay their reactions (see Kaplow (2011)). The firm that increases its price first will expect its rivals to follow quickly because the other firms understand (again, either because of mutual awareness of the common situation or through prior dialogue) that delaying will be taken as cheating, leading the firm that increased its prices to revert back to the pre-existing price level.

The modern game theory literature makes the above intuition more rigorous and extends it along a number of dimensions (see Kaplow (2011)). For example, consider the problem that cartel members face in detecting cheating by other cartel members in markets where each firm's prices

are not readily observed. This challenge was first explored by Stigler (1964). In this setting, should firms observe a fall in sales, this would be taken to infer that cheating occurred. Green and Porter (1984) build on Stigler's approach. In the Green and Porter (1984) model, firms cannot distinguish whether a low realised price is due to exogenous demand fluctuations or due to rivals' cheating by other cartel members. Because of this uncertainty, firms need to choose a strategy that allows rapid, harsh punishment for cartel members engaging in actual cheating, in order to deter it effectively but avoids price wars when no cartel member cheated (in the case of a period of unusually low demand). This extension and many others illustrate how repeated games can be used to accurately show oligopolistic markets actually work.

When I discuss the outcomes above, I also stress that monopolistic outcomes can arise through mutual awareness of the common situation, and do not conceptually rely on dialogue. But the outcome itself (that is, mutually high prices) is not of itself illegal. It is the dialogue, meaning any action or communication the only purpose of which is to reinforce the mutual awareness, which conveys illegality. The problem is that mutual awareness can be enough to give high prices, at least in some cases, and preventing the dialogue may not be sufficient to do so, although it may be all that can be achieved.

B. WELFARE EFFECTS

The main objection to collusion is that it leads to a transfer of wealth and to inefficiencies. To illustrate the welfare effects, consider a cartel selling goods directly to final consumers.¹³ If firms successfully maximize joint profits, assume the cartel price is approximated by the monopoly price. Prices under the cartel are higher and firms are able to appropriate some of the consumer surplus that would go to consumers in competitive markets. Therefore, there is a decrease in the aggregate quantity produced which causes total welfare to decrease and generates a deadweight loss.

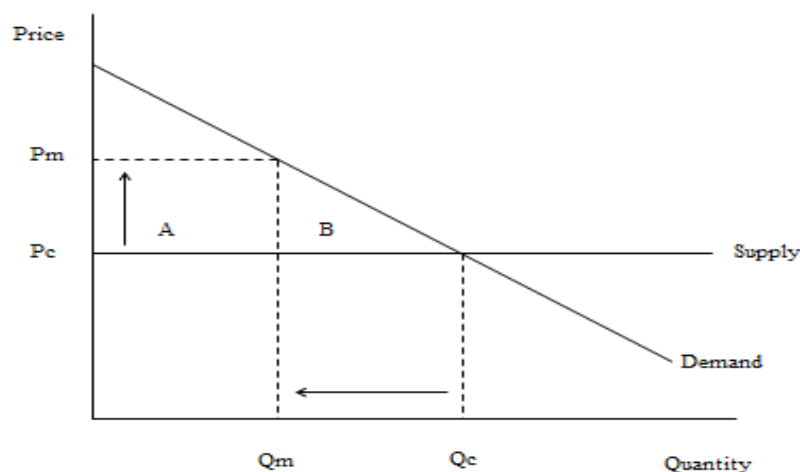
The consequences of a cartel on what would otherwise be a competitive market are illustrated in Figure I-1.¹⁴ Consumers pay P_m instead of P_c and they purchase only Q_m compared with the higher Q_c under competition. The area indicated by A represents the rent transfer from consumers to producers. The rent transfer A, however, does not represent a welfare or efficiency loss as it is a pure redistribution of wealth and has no impact on efficiency. Area B represents the net welfare

¹³ For simplicity, it is assumed that all inputs of the cartel are produced in perfectly competitive markets and that there are no effects outside the value chain, for example for producers of complements or buyers of substitutes.

¹⁴ See Davis and Garcés (2009).

loss, known as deadweight loss. This is consumer welfare that is eliminated due to the restriction in output and not captured by the cartel. The total welfare loss generated by the cartel is represented by area B. The total harm to the consumer is represented by areas A + B.

Figure I-1: Welfare effect of a cartel



South African competition law has a number of objectives including goals based on both economic welfare (promoting economic efficiency and consumer welfare) and non-economic welfare (fairness and the protection of a group of market participants, for example, small and medium-sized enterprises).¹⁵ Supra-competitive pricing associated with cartels is generally regarded as undesirable in itself, which makes sense when one objective of competition law is the maximization of consumers' welfare. The other objective of competition law in South Africa is overall economic efficiency or social welfare. Supra-competitive pricing associated with cartels is still objectionable because, despite firms' gain in profits, the excess of price over marginal cost results in deadweight loss. This loss is associated with sales that would have occurred at the lower, competitive price.

Welfare effects of collusion are not necessarily limited to allocative inefficiency and transfers from consumers to producers. When a cartel raises price and accordingly reduces output, it is not

¹⁵ Section 2 of the Competition Act states that, "the purpose of the Competition Act is to promote and maintain competition in the Republic in order – a) to promote the efficiency, adaptability and development of the economy; b) to provide consumers with competitive prices and product choices; c) to promote employment and advance the social and economic welfare of South Africans; d) to expand opportunities for South African participation in world markets and recognise the role of foreign competition in the Republic; e) to ensure that small and medium-sized enterprises have an equitable opportunity to participate in the economy; and f) to promote a greater spread of ownership, in particular to increase the ownership stakes of historically disadvantaged persons".

always the case that production is allocated efficiently among the firms and this is a further source of reduced welfare. For instance, well-organized cartels have the advantage over less well organised arrangements in that some of this loss in production efficiency can be avoided. Firms might agree to let their more efficient members produce more than they otherwise would permit, in exchange for transfer payments (see Schmalensee (1987)).

Collusion may also cause production inefficiency on account of excessive entry.¹⁶ This is the case in homogenous industries where pricing remains at the monopoly price regardless of how many firms enter; that is, cartel pricing is perfectly effective. In this case, the higher price induces more firms to enter and more will enter until the additional entrant cannot cover its costs (because its share of the monopoly output is too small, even when price exceeds marginal cost). All of the supplemental entry is a social waste. There is no consumer benefit while further production costs are incurred.

3. Detecting collusion

The main challenge in addressing collusion is detection (see Posner (2001)). Because firms have incentives to hide their behaviour particularly so if it may be illegal, it is difficult to identify instances of collusion. One approach is to infer successful collusion from the evolution of pricing, such as the observing significant price increases which are not followed by corresponding changes in cost or observing sharp price decreases which are associated with price wars.¹⁷ However, some firms may be aware of the inferences which may be drawn from their conduct in relation to increasing prices. This awareness may instead lead these firms to adjust prices strategically in order to avoid detection and hide their collusive behaviour.

Facilitating practices make it easier to engage in collusion. Facilitating practices address the challenges of reaching an agreement and enforcing the agreement (in particular, deterring cheating through the prospect that defection will be detected and punished quickly). Because successful collusion is difficult to reach, facilitating practices are important and have long been a

¹⁶ Generally, the literature on the effects of new entry identifies two competing effects (see Mankiw and Whinston (1986)). On one hand, there is a business-stealing effect which leads to excessive entry because prices are higher than marginal cost. In this situation, those firms who enter are able to do so by obtaining profits through diverting customers from incumbents. For incumbents the lost surplus is not taken into account by entrants. The resources which are wasted on excessive entry are an additional cost of supra-competitive pricing. On the other hand, to the extent that products are differentiated, there will be too little entry because firms offering new products do not capture all of the surplus generated by their contribution to product variety. Firms consider only the revenue they obtain, ignoring infra-marginal consumers' surplus. If this effect is sufficiently large, the additional entry induced by price elevation is socially beneficial (see Kaplow (2011)).

¹⁷ See Harrington (2005). Alternatively, margins might be determined from measures of price and marginal cost or inferred from the elasticity of firms' demand curves.

focus of competition policy analysis of the oligopoly problem.¹⁸ The use of facilitating practices provides a basis for inferring the existence of collusion. This inference makes sense when there is no other explanation for the practice or when other explanations can be shown to be implausible in a particular case.¹⁹

For example, information exchange could facilitate collusion by improving accuracy in observing rival behaviour, improving information about future intentions as well as diminishing time lags within which cheating can be more accurately detected and punished. Information exchange on price information may be assumed to be determinative of what constitutes an indirect price-fixing agreement, but it can also be viewed as facilitating practice. In addition, through the use of announcements of future prices, firms hoping to increase the industry price may want to convey their beliefs without taking the risk of raising prices unilaterally first and losing interim sales without being confident whether and how quickly rivals will follow. Firms might also share information about prices and other trading conditions through trade associations. Evidence from many prosecuted price-fixing cartels suggests that secret discussions were held in conjunction with trade association meetings. Trade association meetings provide a cover for the relevant firms.

However, information-sharing activities may also yield procompetitive benefits.²⁰ These benefits might provide an explanation, thereby negating the inference of collusion, and also indicate that it may be socially costly to prohibit the activities. There are several other facilitating practices such as: (1) meeting competition clauses; (2) standardization agreements; and (3) resale price maintenance.²¹ Some facilitating practices are more problematic than are others, while for other facilitating practices the conclusion will depend very much on the circumstances of the particular case.

There are also several factors relating to market structure that affect the incentive and ability of collusive firms to sustain a collusive outcome in repeated game.²² An assessment of the degree to which these structural factors are conducive to successful collusion can sharpen the accuracy of inferences on the ultimate question of whether firms are engaging in collusive conduct. First, collusion cannot be sustained in the absence of entry barriers and it is more difficult to sustain

¹⁸ See Posner (2001), Harrington (2008) and Motta (2004).

¹⁹ The issue with facilitating practices is to distinguish these from agreements in themselves: thus they are practices that firms may choose unilaterally and that could facilitate collusion.

²⁰ For a survey see Raith (1996) and Kuhn and Vives (1995). Raith (1996) proposes a general model for information sharing in an oligopoly which encompasses many of the known results.

²¹ See Motta (2004) and Tirole (1988).

²² Earlier surveys can be found in e.g., Tirole (1988), Shapiro (1989), and Motta (2004).

collusion the lower are entry barriers.²³ Without entry barriers positive profits would invite entry, which would erode the profitability of collusion (hit and run strategies are possible). Future entry reduces the scope for retaliation in response to a deviation, and increases the returns associated with a deviation (price undercutting) in the short run. The number of firms and market concentration are two related factors. With a large number of firms the relative benefits from a short term deviation are more significant when compared with the stream of long term benefits associated with collusion. When there are many firms, reaching an agreement on the terms of collusion and punishment strategy tends to be more difficult and cheating may be harder to detect. There may also be more asymmetry when there are many firms, which also inhibits collusion.

Transparency is another important factor especially when it relates to prices and sales. The lack of transparency on prices and sales makes it much more difficult to sustain collusion. In environment with limited transparency collusion is generally more limited in scope. For example, when firms do not observe individual prices (and therefore cannot infer from readily available market data) cheating on cartel agreement cannot be easily identified and punished. Product heterogeneity also makes collusion more difficult because reaching an agreement on prices and/or other trading conditions is more complex. In addition, when there is significant differentiation, identifying instances of firms cheating is difficult to detect, which makes it difficult to punish deviators.²⁴

Greater similarity on any dimension also supports collusion (see Kaplow (2011)). For example, firms with symmetric production costs will more readily be able to reach an agreement on collusion and none will gain disproportionately from cheating. Furthermore, extensive social contacts and more similar backgrounds of key decision-makers or managers may make reaching an agreement easier.²⁵

²³ In standard oligopoly models with symmetric firms, collusion becomes more difficult to sustain if the number of firms increases (Shapiro, 1989). Friedman and Thisse (1994) analyse a market where firms cannot prevent entry and show that it is possible that an entrant will be integrated gradually into the collusive scheme.

²⁴ Deneckere (1983) derives some basic results on the ability to jointly maximize profits in repeated Cournot and Bertrand duopolies with product differentiation. Increasing the degree of product differentiation has two opposing effects on the ability to collude. In the short run, deviation becomes less profitable, as it is more difficult to attract customers of the rival firm by decreasing the price. But the punishment will also be less severe. Deneckere shows that for quantity setting super-games, the first effect dominates and sustaining collusion becomes more difficult with an increasing degree of substitutability. For price setting super-games this is true as long as the goods are sufficiently differentiated to guarantee that the deviating firm does not capture the whole market. But if the goods are very good substitutes, collusion becomes easier to sustain with a rising degree of substitutability.

²⁵ Such might include educational and social backgrounds, longevity in the industry, and participation in joint ventures and trade association activities.

Multi-market contact may also enhance the strategic space in which punishment may occur.²⁶ When firms co-exist in several markets, it is more costly for them to deviate from a collusive outcome, since they would be punished in all the markets at the same time. However, this explanation is misleading. The deviant firm can also deviate in all the markets at the same time, increasing the short-run benefit of a deviation. Indeed, multi-market contacts help collusion if, by pooling incentive compatibility constraints, they soften asymmetries that arise in individual markets and they allow collusion in markets where it would not be sustainable, by exploiting more favourable conditions on other markets.

In general, the existence of capacity constraints has an ambiguous effect on collusion. A cheating firm may be able to gain more market share if its capacity is larger than the others. But other firms have a greater ability to punish, this follows from the fact that the industry price can only be driven down if firms as a whole can supply a sufficient quantity.²⁷ When there are many firms, it would seem that greater capacity would tend to help cheating firms more since there are more firms that can contribute to the quantity increase required for punishment. This implies that each firm does not need substantial additional capacity. However, the impact of asymmetry in capacity is less ambiguous: collusion is more difficult with an asymmetric distribution of capacities. Imagine that one firm has large capacity and the other small. The large-capacity firm gains more from deviation. The cost of deviation is lower for the large-capacity firm (the small firm is not a tough punisher). To induce the large-capacity firm not to cheat, may require giving the large capacity firm a higher market share.

The fact that collusion is more likely (or conditions are conducive) in a given industry structure gives no evidence that collusion is taking place. Moreover, there are serious concerns about what is referred to as the structure-conduct-performance paradigm. The structure-conduct-performance paradigm in its simplest form holds that market structure determines conduct which in turn determines performance. In the present setting, the proposition would be that market structure factors determine whether firms collude which in turn determines whether firms realize supra-competitive profits.

Concerns about the relationship between structure, conduct and performance arise from empirical evidence or cross-sectional studies of different industries which show that structural factors, such as industry concentration, do not explain any of the variation in profitability. There are also competing explanations to explain the relationship, such as, that concentration can also be a result of one or a few firms being highly efficient than others, which therefore explains their

²⁶ See Bernheim and Whinston (1990).

²⁷ See Brock and Scheinkman (1985).

profitability, rather than being caused by industry-wide supra-competitive pricing. But there is still some justification for paying attention to the micro structural factors which increase the incentive and ability of firms to collude when examining particular cases even when the empirical evidence gives us reason not to place excessive weight on their relevance.²⁸ From a competition policy perspective, the issue is to be aware of those industries in which collusion is likely to be effective and damaging.

4. Corporate leniency policies

Leniency programmes grant complete or partial exemption from prosecution for firms that collaborate with the competition authorities. A leniency policy was first introduced in the US in 1978 and reformed in 1993. In the European Union, the leniency programme was introduced in 1996 and modified in 2002.²⁹ In South Africa, the corporate leniency policy (“CLP”) came into force on 6 February 2004 and was modified in 2008. Before the adoption of the CLP in February 2004, few cartels were investigated and prosecuted under the Competition Act. Perhaps this was because of the intrinsically secret nature of cartels which renders both their detection and investigation difficult. The CLP is meant to destabilize cartels by encouraging firms to defect and report. The CLP is meant to assist the Commission in prosecuting cartels under section 4(1)(b) of the Act.

The CLP provides for a cartel member to receive immunity from prosecution before the Tribunal and from administrative fines in return for disclosing all relevant information and documents relating to the cartel activity. Only one member of a cartel may be granted immunity. As a result, the CLP creates a race to the door by rewarding the first member of the cartel to provide evidence on the cartel. The CLP does not make provision for granting partial immunity to second or third applicants, or for determining an applicable reduction in the fine.

The CLP explicitly requires that applicants confess their participation in a cartel in return for immunity. The CLP is applicable to any cartel conduct falling within the ambit of the Act. The CLP provides that CLP applications may be made in relation to cartel activity that the Commission is not aware of. The Commission will also accept applications with respect to cartel conduct that the Commission is aware of, provided the Commission does not have sufficient information or no investigation has yet been initiated the CLP provides for immunity to be granted on a conditional basis.³⁰ Granting of immunity is a continuous process that is only

²⁸ See Bresnahan, (1989).

²⁹ See Motta and Polo (2003) and Aubert et al. (2005) for further details on leniency programs in the US and the EU.

³⁰ Motta and Polo (2003) point out that antitrust authorities may not always be able to provide enough evidence to prove that there was an illegal agreement among firms although it has started an investigation. Prosecuting a cartel is

concluded upon a final determination being made by the Tribunal or if the decision is appealed, the Competition Appeal Court.

5. Industry background

As a prelude to the essays, it is useful to begin with a brief overview of the grain industry. Under the apartheid regime, markets for most agricultural products were regulated. The first democratic government's trade liberalisation programme converted to tariffs (and reduced the tariffs themselves), the quantitative trade restrictions on agricultural products. The reforms represented a wide-ranging move away from statutory intervention and were geared towards promoting market efficiency and competitiveness in the sector. It was expected that under de-regulated conditions of free competition prices would, on average, be lower and that firms would be more efficient as competitive rivalry spurred them to cut costs.

With the liberalisation of agriculture in 1996, agricultural commodity prices much more closely linked to the global agricultural economy and global price movements. For example, local prices for maize and wheat tend to track international price movements after taking into account transport costs. In effect, farmers, who benefited from protection as well as other support measures in the past, are more exposed to volatility from international prices as well as exchange rate movements which may have been exacerbated by speculation. Traders tend to follow import/export parity calculations to determine prices. South Africa is a net importer of wheat, the price of wheat tends to be set at import parity. Pricing of maize gravitates between export and import parity depending on whether there is a surplus or a shortage.

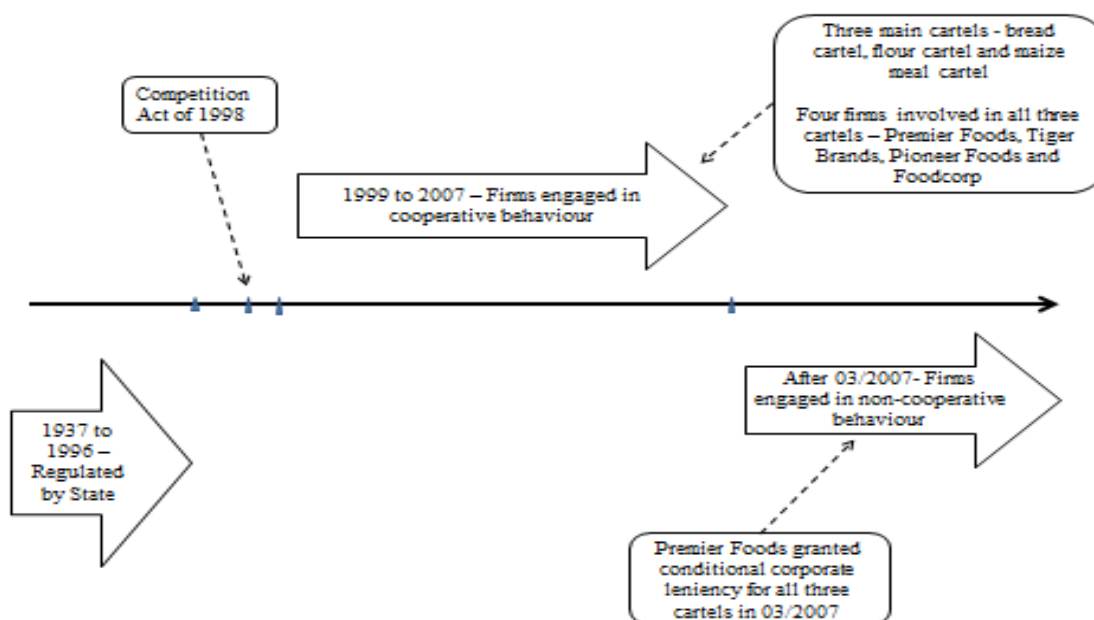
The grain industry is one of the largest industries in South African agriculture producing between 25 per cent and 33 per cent of the total gross value of agricultural production. Grains grown in South Africa include maize, wheat, barley, soybeans, sunflower, groundnuts, oats, canola and sorghum; and end-products include maize meal, bread, starch products, glucose, flour, animal feed, sunflower oil, margarine, peanut butter, etc. The grain value chain under regulation was relatively uncomplicated, in that the industry operated through a fixed channel system and the Control Boards were the main intermediaries between the farm gate and the processing levels. Various inputs and services were provided by agricultural farmer co-operatives, with high levels of support from the government.

costly and leads to conviction only with a certain probability. Therefore, leniency programs that apply to firms who cooperate after an investigation has started might have an important role in the prosecution of cartels.

While liberalisation removed direct controls, the subsequent unveiling of cartels suggests that extensive anti-competitive arrangements replaced direct regulated control. Firms involved with the baking of bread and the milling of wheat and maize engaged in cartel conduct with the goal of limiting competition. Contributing factors to these market outcomes include high entry barriers, the high level of industry concentration, vertical integration, multimarket contact, market transparency and symmetry in costs and market shares. Given the market structure, the history of the industry and the extensive social networks, overcoming the coordination problems necessary to establishing a cartel was relatively easy. Upon the creation of the cartel, incentives for each firm to cheat were immediately created. Each firm in the cartels had an incentive to cut its price, increase its output and gain market share, and thereby increase its profits. But if each firm did so, collusion would immediately dissolve into competition. With repeated interaction, the ability to enforce collusive agreements became an important part of the cartel arrangements.

The cartels were uncovered in 2007 following an application for corporate leniency by one of the cartel firms (see Figure I-2). The successful prosecution of the bread and the milled wheat and white maize cartels demonstrates that cartels have pernicious effects on poor consumers despite the obstacles created by legal prohibitions on collusion (Section 4 of the Competition Act) and individual firm's incentives to compete rather than to collude.

Figure I-2: Timelines



6. Introduction to the essays

Collusion covers what is undoubtedly the most settled area of competition law and policy in most countries around the world. In this study, I unsettle the discourse somewhat by suggesting that very little is known about collusion in South Africa. The essays below will look at three central topics of this study: cartel overcharges, cartel stability and remedies. In each essay (albeit to varying degrees), the study will evaluate both the theoretical and empirical issues involved. To improve our understanding of competition policy and its administration, the economic understanding will be joined with appreciation for case specific issues and the law.

Essay One analyses the South African flour cartel which was active from 1999 to 2007 and provides an overcharge estimation by using comparator based methods. The empirical analysis is complemented by a descriptive overview of the history and structure of the South African flour industry. The flour cartel fixed the price of flour and allocated customers from 1999 to 2007. I find that the overcharges to independent bakeries range from 7 per cent to 42 per cent. I also show that the cartel profits were approximately two times higher during the cartel than the price war year 2002 or the post collusion year 2008.

In Essay two, I examine the extent of market power in the flour industry. I ask whether observed prices and quantities in the flour industry reflect switching from collusive to non-collusive behaviour and test for this empirically. Within the framework of a structural model of equilibrium pricing, I specify a simultaneous equation switching regression model in which the parameters of the demand and cost functions are estimated. My estimated conduct parameters suggest that the level of market power exercised by the flour millers is quite low in both periods. The perfect collusion hypothesis is rejected by the data. In addition, the estimated level of the conduct parameter diverges from those implied by the models of competition and therefore I cannot define precisely the firm behaviour.

Essay three explores the strategic behaviour adopted by the cartel and in particular Pioneer Foods to create artificial barriers to entry. This essay focuses on the following questions. First, how did Pioneer Foods and the bread cartel respond to entry? Second, how effective was Pioneer Foods' conduct in maintaining collusion under the threat of entry? I provide direct evidence of cartel predation through below-cost pricing in the bread industry by comparing prices to average variable costs. I find evidence of episodes of predatory pricing. **Essay four** critically discusses the use of remedies in pursuing distributive justice through the restoration of competition, deterrence, and disgorgement of profits. More specifically, the design and objectives of the Pioneer Foods settlement agreement is examined. The remedies that were concluded with Pioneer Foods

constitute a major measure of “success” in the enforcement of competition law in developing countries. They included, among others, an administrative fine, part of which by agreement was set aside for the creation of an Agro-processing Competitiveness Fund aimed at lowering the barriers to entry, as well as a commitment to reduce prices on the sale of flour and bread over an agreed period designed to stimulate rivalry while at the same time enabling smaller non-vertically integrated participants to compete in bread. I also demonstrate the impact of the discount remedy, using a comparative approach.

With Pioneer Foods admitting to its involvement in milled wheat and milled white maize cartels as well as engaging in general exclusionary conduct, there was little suspense over the existence of most egregious offenses in competition law and the subsequent harm to consumers and competition. For some, the competition law remedies and in particular the discount remedy that was adopted, following confirmation by the Tribunal, constitute a key measure of ‘success’ for the cases. **Essay five** evaluates this claim by examining the design and effectiveness of the discount remedy from a comparative perspective. I find that the period before, during and after the Pioneer Foods discount remedy was characterised by increasing wheat prices. However, the increasing wheat prices did not translate into increased bread prices during this period. Further, the discount remedy also induced responses from Pioneer Foods’ main competitors resulting in even wider gains for consumers than Pioneer Foods’ own price reduction commitment. South Africa was shielded from higher bread prices, in part because of the Pioneer Foods discount remedy, albeit temporarily during the discount remedy period. After the discount remedy period, prices of bread increased sharply.

II. ESSAY ONE

THE SOUTH AFRICAN WHEAT FLOUR CARTEL: OVERCHARGES AT THE MILL

1. Introduction

One important presumption of competition law, and the least controversial, is that cartels are bad for consumers because they increase prices and reduce supply. The South African competition regime, like those elsewhere around the world, prohibits cartels.³¹ Yet firms continue to find collusion to be very profitable.³² The *per se* illegality of cartel conduct has not been an efficient deterrent. For this reason, competition authorities around the world, including in South Africa, have recently increased their effort to detect and deter cartels.

Complementing the work of competition authorities, academics such as Harrington (2004a), Harrington (2004b), Levenstein and Suslow (2004), Connor (2004) and Connor (2001) have improved our understanding of the pricing dynamics of cartels. On the empirical side, there exist a number of case studies focusing on the workings of specific cartels. These case studies investigate how the cartel operated, how effective it was in sustaining collusion and how large the generated welfare losses actually were. Examples of such studies include Porter (1983), Ellison (1994), Porter and Zona (1999), Genesove and Mullin (2001), Röller and Steen (2006), Asker (2010) and de Vanssay and Erutku (2011).³³

The legacy of apartheid in South Africa, largely due to extensive regulation and state support, resulted in an economy that was highly concentrated. Protectionist policies were aimed primarily at encouraging import substitution industrialization. Post-apartheid, the South African government took significant steps to liberalize many of the formerly price regulated markets. Industry restructuring led to the break-up of regulated cartels, but what lagged behind was the strict enforcement of competition policy to ensure that competition was being preserved. It turns out that liberalization inadvertently, by increasing competition in formally price regulated markets, increased the incentives for firms to participate in cartels. Hence, many formerly price regulated industries turned to collusion after liberalisation.

³¹ Section 4(1) (b) of the Competition Act 1998, as amended, prohibits price fixing, market allocation and bid rigging.

³² Perhaps one reason for the persistence of cartels is a desire to have a 'quiet life' on the part of managers. Managerial slack may provide a motive of managers forming a cartel that may not show up in the form of profitability but x-inefficiencies.

³³ Connor and Lande (2006) and Levenstein and Suslow (2006) offer surveys of contributions to the empirical research on inter-industry studies of samples of cartels.

The wheat value chain was extensively regulated by the state from 1937 to 1996. The Wheat Board was the main intermediary between the farm gate and the processing level of wheat products. Marketing of wheat was regulated through a single channel marketing system administered by the Wheat Board. The Wheat Board was sole buyer and seller of wheat at predetermined prices. The Wheat Board also controlled imports and exports of wheat and flour. With liberalisation, the expectation was that millers would compete. Competition it was hoped would result in low prices of flour and bread. But instead of competing, the millers simply replaced state regulation with private regulation.³⁴ The flour cartel was uncovered in 2007. The cartel was uncovered when Premier Foods, one of firms involved in the cartel, applied for and was granted corporate leniency in terms of the CLP. The cartel fixed the price of flour, bread and maize meal and allocated customers in flour and bread from 1999 to 2007.

Before analysing the effect of the wheat flour cartel on prices, an understanding of both the wheat flour market and the cartel arrangement is an essential precondition. In section 2 I outline the policy background and market dynamics of the flour industry. Section 3 describes the flour cartel. After the liability of the cartel is established, the task is to determine overcharge estimates due to price-fixing using a reduced-form price equation. In Section 4, I present the estimated results of the overcharge. I use both private and publicly available price data to estimate the cartel price overcharge. In particular, I find that the overcharges to independent bakeries in flour range from 7 per cent to about 42 per cent. Section 5 concludes.

2. The industry

A. POLICY AND HISTORICAL BACKGROUND

Wheat cultivation is one of the oldest agricultural activities in South Africa.³⁵ Wheat milling is one of the oldest industries. It all began with first European settlement in the Western Cape

³⁴ Government regulation of the milk sector began as early as the 1930s through minimum price regulation for certain products. This was achieved through various milk and dairy control boards. The system of control boards was abolished in 1997 when the Marketing Act of 1968 was abolished. In March 2006, the Commission initiated a complaint against milk processors. The Commission alleged that during the period January 2002 to March 2006, milk processors had directly and indirectly fixed procurement prices for raw milk. See Tribunal Consent Order in the matter between the Commission and Lancewood Cheese. Tribunal Case No 103/CR/Dec06.

³⁵ See Section 7 Committee Evaluating the Deregulation Process: the wheat to bread value chain report, 1999. National Agricultural Marketing Council.

province. The wheat industry grew rapidly in the 19th century, in line with the increased demand.³⁶ This growth was supported by the introduction of improved farming equipment.

Import duties on wheat and flour were first imposed in 1826.³⁷ The import duty on wheat was suspended because of a local crop failure between February 1920 and June 1921. At the same time, world wheat prices declined after 1920. This period also witnessed a reduction in local freight charges. When selling their produce, local farmers were exposed to competition from imported wheat, which could be landed and transported inland at lower cost. So they began lobbying for higher protective duties. Due to their lobbying efforts, between 1921 and 1926, a dumping duty was imposed on Australian wheat. The dumping duty was superseded in 1926 by a tariff increase.

To support local farmers, prices of wheat were artificially maintained at a level which made wheat production in South Africa profitable. Due to a further reduction in world prices in 1930 and 1931, the import duty on wheat was increased while imports of flour and maize meal were placed under permit. Special customs duties on a sliding scale were also imposed to raise the minimum import price of wheat, flour and maize meal.

The control of imports and the high protective tariffs were instrumental in maintaining the local price level, but prices were constantly under pressure to fall because of over-supply in the market. In light of this, co-operative groups attempted to regulate supply and carry over surpluses for use in years of shortages.³⁸ Importantly the powerful lobbying efforts of co-operative groups led to the creation of the Wheat Board in 1935.³⁹ The Wheat Board was essentially empowered, to regulate the flow of wheat to the market by paying storage compensation in respect of wheat stored by co-operative groups and farmers.⁴⁰ The Marketing Act of 1937 introduced the Wheat Control Scheme giving the Wheat Board the sole right to sell wheat. In addition, the Marketing

³⁶ See Vink (2012).

³⁷ The increasing population of settlers coupled with the discovery of the diamond and gold fields, led to significant growth in wheat production in South Africa. In addition, the development of railways, in conjunction with reduced freight charges, resulted in wheat cultivation being restricted to areas where natural conditions were most suitable, while shortages were imported from overseas.

³⁸ The costs and risks attached to these efforts were borne by the co-operative producers.

³⁹ Under Section 19 of Act No 58 of 1935.

⁴⁰ During the first two years of its existence the Wheat Board had a difficult task as a bumper crop was reaped in 1935/36 and there was a surplus on hand in 1936/37. By utilising its levy revenue on wheat milled in the country and with the aid of Government, the Wheat Board succeeded in preventing a price collapse, although a decline in prices did take place. Wheat growing was the most profitable branch of farming during the depression years.

Act empowered the Wheat Board to fix prices from producer to consumer and to rationalise the milling and baking industries, subject to ministerial approval.⁴¹

With the outbreak of World War II, the Wheat Board introduced subsidies on grade A wheat to increase production. Subsidies to producers continued up until 1957. After 1957 the subsidy was paid only on bread flour. After 1977 the subsidy was paid only on flour intended for the baking of standard bread. The subsidy was paid to the baker with the objective of keeping the price of bread to the consumer as low as possible. The Wheat Board ceased regulating the prices and marketing of products derived from the processing of winter cereals in 1991, although it continued regulating the production price of wheat. The bread subsidy was also abolished in 1991, while value added tax on white bread was introduced.

In summary, up until the 1990s the marketing of agricultural products in South Africa, including grain products, was extensively regulated by the state through the Marketing Act of 1937 (consolidated in the Marketing Act of 1968).⁴² Institutions mandated to implement the legislation included the Land and Agricultural Bank as well as Control Boards. Specific to wheat, the Wheat Board was the main intermediary between the farm gate and the processing level of wheat products. Marketing of wheat was regulated through a single channel marketing system administered by the Wheat Board.

The Wheat Board was sole buyer and seller of wheat at predetermined prices. The Wheat Board also controlled imports and exports of wheat and wheat flour. Millers were obliged to take up all locally produced wheat for milling. Fixed price schemes and the agricultural co-operatives were generally appointed as agents of the relevant boards. The co-operatives functioned as regional monopolies. Under these schemes, farmers were paid a fixed price on delivery to the co-operative. This resulted in substantial cross-subsidisation from farmers proximate to the market to farmers situated further away from the market. The system was meant to reduce regional differences and ensure the stability of agricultural prices.

The first democratic government initiated a complete transformation of the industry with the introduction of the Marketing of Agricultural Products Act, No. 47 of 1996. The new Act dramatically changed agricultural marketing. Changes included the closure of the Wheat Board, a conversion from quantitative trade restrictions to tariffs and gradual reductions in the tariffs

⁴¹ Co-operatives and other agents were engaged at a commission, to receive, grade and finance the wheat, and store and deliver it to millers on the instruction of the Wheat Board. The apartheid Government used to protectionist policies to support favoured firms. See also Groenewald (1964). In September 1949, the Wheat Control Scheme became the Winter Cereal Scheme with control extended to include barley, oats and rye.

⁴² See Vink and Kirsten (2000).

themselves. The South African Futures Exchange (“SAFEX”) for agricultural products was established in the free market environment as a hedging instrument.⁴³

B. MARKET DYNAMICS

Wheat represents one of the most important field crops in South Africa.⁴⁴ The wheat industry is important because it contributes significantly towards the total gross value of agricultural production. In addition, milled wheat in the form of flour is a key input into bread, one of the main staple foods for South Africans. The purpose of milling is to break up the grains of wheat into flour (which comes from the centre of the grain or endosperm), bran (the skin of the wheat) and pollard (the dusty material created during the grinding process). The aim of the miller is to extract the maximum proportion of flour from the grain with the least possible contamination by bran and/or pollard because they discolour the flour and reduce quality.

The wheat milling process consists of three stages, each with its specific type of machinery. In the *break process*, roller mills are used to gently crack the wheat kernel open to prepare the wheat for further processing, with the aim of removing as much as possible of the bran from the endosperm. In the *scraping process*, the endosperm is scraped from the bran and is refined by means of roller mills, sifting machines and purifying methods. In the *reduction process*, the endosperm is finally refined by means of smooth roller mills and graded by sifting machines. The flour made from the endosperm is mainly used for human consumption and comprises a mixture of fine granules of starch and protein.

Wheat is generally classified as hard or soft. Hard wheat has higher protein content than softer wheat and is mainly used for bread. Soft wheat is more suitable for confectionary and biscuits. The main products produced from the wheat milling process in South Africa include brown and white bread flour (used for baking bread, white bread flour accounts for about 40 per cent of sales, while brown bread flour accounts for about 26 per cent of sales), industrial flour (sold to only industrial users and is not available to end-customers, it accounts for about 1 per cent of flour sales), wheat offal (used for cereals and/or sold to the animal feed manufacturing industry) and cake flour (used to bake cakes and accounts for about 30 per cent of sales).

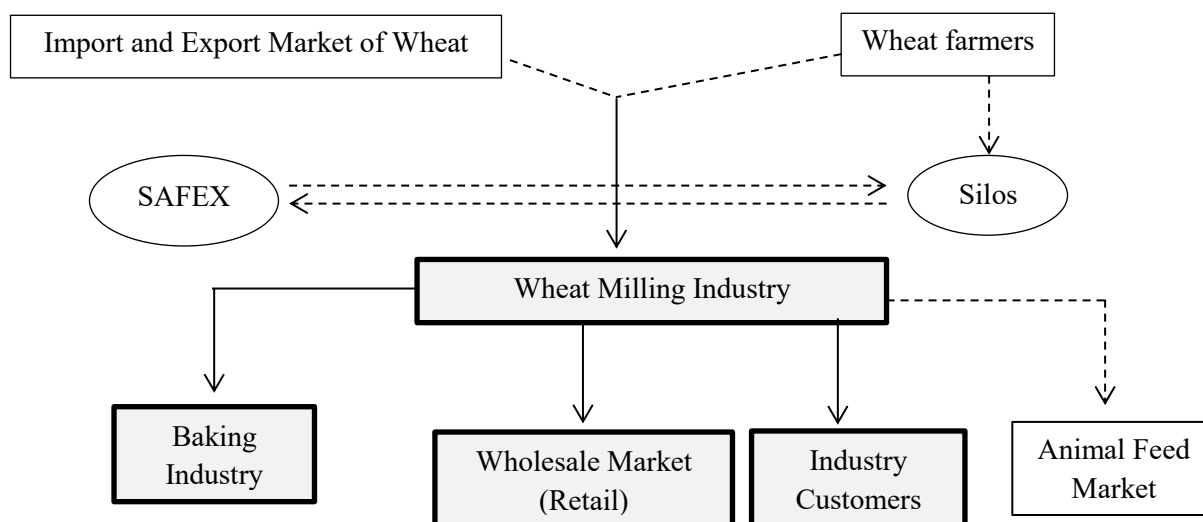
Figure 1-1 provides an overview of the wheat to flour value chain. South Africa has 4 major firms in the milling industry namely Pioneer Foods, Tiger Brands, Premier Foods and Foodcorp. These firms are all involved through their various divisions in wheat milling and baking industries. In

⁴³ Post liberalisation the grain value chains generally consist of six key levels; (1) the input (e.g. fertiliser) for agricultural production; (2) agricultural producers (farmers); (3) storage and trading of grain; (4) the milling, processing of grain for supply on a wholesale basis; (5) retail of wheat products; and (6) end-consumption.

⁴⁴ See Meyer and Kirsten (2005).

addition, these firms were all involved in the flour and bread cartels. The flour cartel also included a smaller firm, Godrich Flour Mills. The firms in the flour cartel accounted for more than 98 per cent of all flour sales.

Figure 1-1: The value chain



The flour industry is highly concentrated and is characterised by multi-market contact, homogenous products and a history of collusion, both at the level of milled wheat and in the main end consumer product, bread. The firms interact in more than one than one market at the same time. In particular, the firms have extensive presence in a number of geographic markets. They bake bread, mill white maize and produce other foodstuffs such as pasta. Furthermore, the flour and bread industries were extensively regulated prior to 1996.⁴⁵

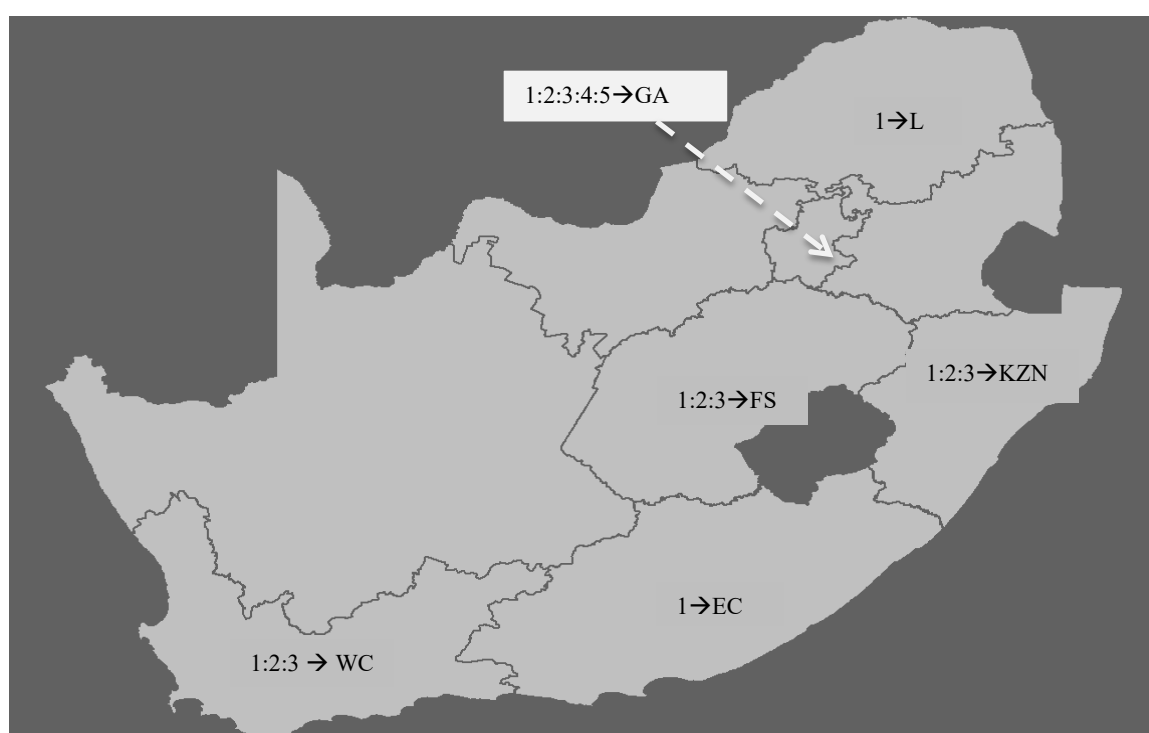
Flour is essentially an intermediate product either used internally by vertically integrated companies for their own bakery operations or it is sold to other firms to bake bread or manufacture other products such as cakes and biscuits. Although bread and maize meal are staple foods and the main sources of energy for the majority of South Africans, it does not imply that flour and maize meal are substitutes. Various other factors such as consumer income, demand and supply, differences in nutritional value, seasonal output of raw product, regional consumption patterns, etc., also affect consumer decisions.

Flour and maize meal are not competing products and are in separate product markets. There is no supply side substitution between wheat milling and maize milling. The size differences between

⁴⁵ Cartels in flour have also been discovered elsewhere around the world. In Europe, the Dutch, Belgian and German competition authorities have all recently prosecuted flour cartels. For example, on 22 December 2010, the Netherlands Competition Authority concluded that 15 flour milling firms agreed to share the market in order to limit competition and even went as far as to buy out and shut down rivals that would not join the cartel.

the wheat and the maize kernels mean that the settings and design of the milling equipment is different. Converting a maize milling plant into a wheat milling plant requires replacing all the milling equipment which requires significant capital outlays. It is for this reason that the milling companies tend to design and configure their milling facilities in terms of the type of product. Competition takes place at both national and regional levels. The competitive dynamics are associated with sourcing of wheat, the supply and demand balances across regions and the significant transport costs. Flour producers are able to compete with each other on a national level through a network of storage depots and regional scattered mills across the country (see Figure 1-2).

Figure 1-2: Location of wheat mills by the major milling companies



Notes: 1 = Pioneer Foods; 2 = Tiger Brands; 3 = Premier Foods; 4 = Foodcorp; 5 = Godrich; WC = Western Cape; EC = Eastern Cape; KZN = KwaZulu-Natal; GA = Gauteng; FS = Free State; L = Limpopo

Raw wheat is sourced through the SAFEX from traders and farmers, and can also be purchased directly from farmers in what is referred to as the ‘physical market’. If wheat is delivered through SAFEX, the seller of the wheat must ensure that the wheat is delivered according to the SAFEX rules of delivery and the location difference to factor in the transport costs will be reflected in the final price.⁴⁶ More than 80 per cent of wheat in South Africa is produced in the Free State,

⁴⁶ The price of wheat on different markets is adjusted to take account of the differences in transport costs, exchange rates, etc., in order to make comparisons possible. Such an adjusted price is called a reference price; it is calculated with respect to a reference point. In the case of grains in South Africa the commonly used reference point is

Western Cape and Northern Cape provinces. South Africa is not a major producer of wheat in the world and wheat is imported to supplement domestic production: South Africa is a net importer of wheat. Wheat prices are generally lowest in the Western Cape, where there is generally a local surplus and prices are set against the inland (Randfontein) price, determined by import parity through Durban, less transport from the Western Cape.⁴⁷

3. The flour cartel

There are two main elements to successful collusion. The first element is reaching an agreement. There must be some understanding among the firms regarding what conduct is permitted under the terms of the collusive agreement, for example, the prices that the firms will charge. The second element is enforcing the agreement. Timely detection of deviations from a collusive agreement and a credible mechanism for the punishment of deviations are key conditions to enforcing the agreement. Specifically, detection and punishment must be sufficient to deter individual firms' incentive to cheat on the agreement, typically by cutting prices in the short-term, in order to achieve greater profits through a higher market share, at the expense of the other firms, before the latter can respond.⁴⁸

A. ORIGIN AND GENERAL DESCRIPTION OF THE CARTEL

Private meetings and telephone contacts between the wheat milling firms began in 1999 and carried on until March 2007.⁴⁹ It appears that the cartel started subsequent to the de-regulation of the industry. Instead of competing, the flour producers replaced the regulated cartel with private

Randfontein. In order to adjust prices to this reference price, the international commodity price ('free on board' or FOB Gulf price) has to be adjusted to take account of all the costs incurred in bringing the wheat to Durban. This price, called the CIF price, is adjusted to local currency using the current exchange rate. Once this is done, all local Rand based costs (off-loading, losses, interest, local transport costs) can be added resulting in a final landed (local) price per tonne at the point of consumption, or the reference point.

⁴⁷ The Competition Tribunal ("The Tribunal") highlighted the above dynamics in the matter between CTH and Senwes, noting that "while trading (derivative) market may be national, in the sense that traders are located nationally and compete for supplying processors nationally, geography cannot thereafter be dispensed with." It further also recognised that in the market for the physical supply of grain there is a competitive advantage to having the best location for storage. Simply put, while millers can procure nationally through SAFEX trading, the regional dynamics will ultimately be reflected in the transactions. See the Competition Tribunal's decision in Case Number 110/CR/Dec06.

⁴⁸ For recent extensive surveys of the evidence of collusive activity, see Levenstein and Suslow (2006).

⁴⁹ See Commission press release, 13 December 2012 Competition Commission settles milling case with Foodcorp. Available at <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Commission-settles-milling-case-with-Foodcorp-.pdf>

agreements. Cheating on cartel agreement was part of the collusive equilibrium. Flour producers have similar overhead costs and hence, it was very easy for the firms to lose market share and customers when they increased their prices especially following an increase in the price of raw material. Some firms would delay on the increase in price and therefore attract customers of those firms that had already increased their prices. These cheating episodes led to discussions between firms and co-ordination of price increases in an effort to “stabilise” the market. The firms understood that co-ordination was necessary for them to avoid losing customers and market share.

The cartel’s internal enforcement mechanism was such that when deviations became visible, the cartelists first communicated before reverting to a price war. The cartelists only met when there was some instability in the market. When the market was running smoothly with firms increasing their prices after the increase in raw material costs, there was no need to have any discussions. However, when some firms decided to cheat, by for example holding over on the increase, the discussions would then become necessary.

The cartel meetings were held at regional and national levels. Cartel meetings took place at different locations in the different provinces. For example, in some provinces, the meetings were better known as “church meetings”. Indeed, the price fixing meetings were held in church halls and were, quite astonishingly, often preceded by a prayer. In other provinces, the firms organised themselves into regional forums and the meetings were not only structured in the sense that the meeting dates were agreed upon in advance, the meetings were chaired by different people. The illicit agreements were not based upon any precise formula, although a pattern can be discerned:⁵⁰

- i. A core group of firms, namely Tiger Brands, Pioneer Foods, Premier, Foodcorp and Godrich Flour Mills were involved in the cartel.
- ii. Up to and including 2003, the firms had multilateral and bilateral meetings every 4 to 6 weeks in which they discussed price increases, implementation dates and customer allocation by region. The cartelists were usually present at all meetings and those that were not present, were brought or kept up to speed on developments and discussions by those present. During various periods when there were no meetings between the representatives of the milling firms, ad hoc contact was maintained by way of telephone calls.
- iii. The firms had an agreement not to target one another’s customers (bakeries and other big wholesalers and retailers). This so-called “gentlemen’s agreement” in the industry amounts to customer allocation and was also used as a method of monitoring behaviour, pricing and market shares over time. If a customer of a competitor approached a milling

⁵⁰ See Competition Commission and Pioneer (Consent Order), Case number: 15/CR/Mar10. Available at: <http://www.comptrib.co.za/assets/Uploads/1015CRMar10-Pioneer.pdf>

company for a price, it was understood that they should be offered a high (uncompetitive) price. In certain cases where a competitor did indeed target and poach a customer by low pricing there would be telephone calls and sometimes meetings to discuss the situation and to ensure that all members adhered to this understanding at all times.

- iv. After 2004 there were regular telephone contacts and infrequent multilateral and bilateral meetings. It is not clear what changed after 2004, perhaps the cartelists were trying to elude detection by customers and the authorities.
- v. Price lists were determined nationally, together with minimum prices to which regional marketing and sales managers could discount. These price lists were then sent to the regional managers. The regional managers had some discretion in deviating from these lists, although they had no mandate to adjust prices below the minimum national prices.
- vi. In 2006, the core group of the cartelists met and discussed national prices and these were filtered down to the regions.
- vii. The meetings initially occurred frequently but fizzled out later and occurred mostly when there was non-compliance with the “gentlemen’s agreements” or when firms failed to raise their prices after an increase in the price of raw material or as agreed.

B. COMPETITION TRIBUNAL DECISIONS AND TIMELINES

Section 4 (1) (b) of the Competition Act provides that an agreement between, or concerted practice by, firms or a decision by an association of firms, is prohibited if it involves directly or indirectly fixing a purchase or selling price or any other trading condition or dividing markets by allocating customers, suppliers, territories, or specific types of goods or services. The firms must be in a horizontal relationship.⁵¹ Section 4 (1) (b) of the Competition Act is a *per se* provision. The mere occurrence of the specified conduct will attract liability. It is not open for justification but it must nevertheless be established that the prohibited conduct has taken place.⁵²

Premier Foods, Tiger Brands, Pioneer Foods and Foodcorp have all admitted that their conduct contravened section 4 (1) (b) of the Competition Act. They have admitted that during the period between 1999 and 2007, they were all part of a cartel that fixed selling prices as well as the implementation dates of such prices and allocated markets for flour.

⁵¹ Section 1(1) (xiii) of the Competition Act defines a horizontal relationship as one that exists between competitors.

⁵² American Natural Soda Ash Corporation v Competition Commission 2005 6 SA 158 (SCA).

When Premier Foods applied for corporate leniency in terms of Commission's corporate leniency policy in the bread cartel case, it also indicated that the cartel extended to the milling industry as well.⁵³ Because of Premier Foods' co-operation with the Commission's investigation and its confession to its role in both the bread cartel and the milling cartel, Premier Foods was granted conditional immunity from prosecution on 16 March 2007.

Tiger Brands corroborated Premier Foods' allegations and entered into a consent agreement with the Commission on 9 November 2007. In terms of the consent agreement, the Tribunal imposed a fine on Tiger Brands for its role in the bread cartel. Tiger Brands confessed its role in the bread cartel and provided further evidence on the milling cartel. Tiger Brands co-operated with the Commission in its investigation and was granted conditional immunity from prosecution in terms of the corporate leniency policy.⁵⁴

On 6 January 2009, the Tribunal confirmed a consent agreement between the Commission and Foodcorp regarding Foodcorp's involvement in the bread cartel and imposed a fine.⁵⁵ On 3 February 2010, after contested proceedings, the Tribunal found that Pioneer Foods had been involved in a conspiracy to fix the prices of bread as well as market allocation in the Western Cape province and nationally.⁵⁶

The flour cartel complaint was referred to the Tribunal for determination on 15 March 2010. On 30 November 2010, the Tribunal confirmed a consent agreement between the Commission and Pioneer Foods regarding Pioneer Foods' involvement in the milling cartels.⁵⁷ On 12 December 2012, the Tribunal confirmed a consent agreement between the Commission and Foodcorp

⁵³ On 14 March 2007, the Commission initiated a complaint against Tiger Brands, Pioneer Foods, Foodcorp and Godrich Milling in respect of alleged collusive activities in the wheat milling industry.

⁵⁴ The Tribunal imposed a fine of R98 million on Tiger Brands for its role in the bread cartel. This represented about 5.7 percent of its turnover from baking for the financial year 2006. See Commission press statement, 12 November 2007, Tiger Brands admits to participation in bread and milling cartels and settles with Competition Commission. Available at: <http://www.compcom.co.za/2007-media-releases/>

⁵⁵ The Tribunal imposed a fine of R45 million on Foodcorp. This represents 6.7 percent of its turnover for baking operations for the financial year 2006. See Commission press release, 5 January 2009, Competition Commission settles with Foodcorp. Available at: <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/5-Jan-09-CC-Settles-with-Foodcorp.pdf>

⁵⁶ The Tribunal ruled that Pioneer Foods had engaged in fixing the price of bread products in the Western Cape province and nationally and imposed a fine of R196 million. See Competition Commission v Pioneer Foods (Pty) Ltd (15/CR/Feb07, 50/CR/May08), Available at <http://www.saflii.org/za/cases/ZACT/2010/9.html>

⁵⁷ See also Bonakele and Mncube (2012) for details on the design and objectives of the Pioneer Foods settlement agreement. The remedies that were concluded with Pioneer Foods constitute a major measure of "success" in the enforcement of competition law in developing countries. They included, among others, an administrative fine, part of which by agreement was set aside for the creation of an Agro-processing Competitiveness Fund aimed at lowering the barriers to entry, as well as a commitment to reduce prices on the sale of flour and bread over an agreed period designed to stimulate rivalry while at the same time enabling smaller non-vertically integrated participants to compete in bread.

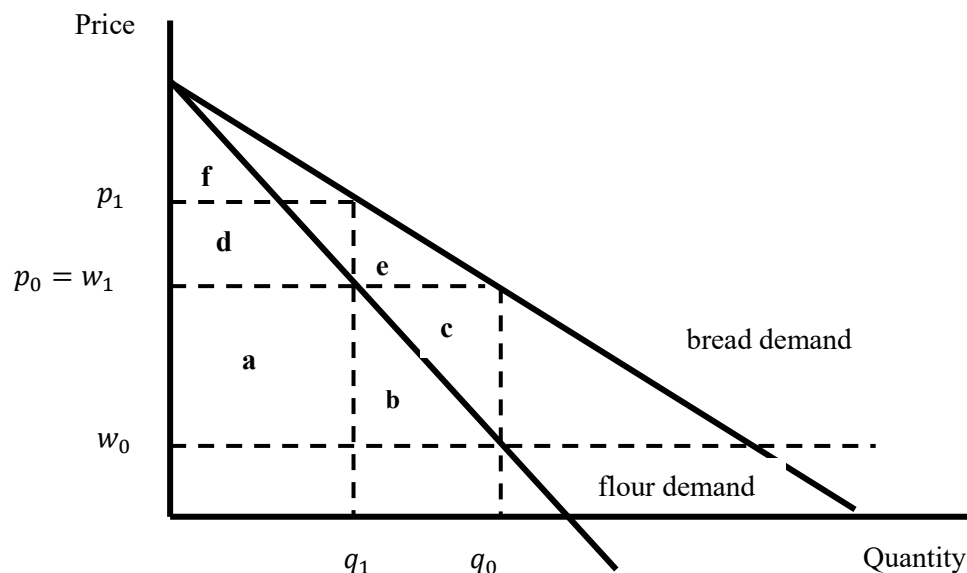
regarding Foodcorp's involvement in the milling cartels and imposed a fine.⁵⁸ Godrich Flour Mills is contesting the Commission's findings and the Tribunal is still to adjudicate at the time of writing.

C. THE CARTEL AND HARM TO INDEPENDENT BAKERIES

Suppose there is a vertically integrated cartel producing flour and bread. The vertically integrated cartel sells flour to independent bakeries, who use the flour to bake bread and compete with the vertically integrated cartel in the bread market. Competition in the bread market can be characterised as involving a cartel (given that the cartel controls in excess of 98 per cent of the market, this is akin to a monopoly baker) with a competitive fringe. Figure 1-3 below shows the demand for bread and the demand for flour (the intermediate product), which is used in the production of bread.⁵⁹

Let w_0 denote the flour price in the absence of a cartel and p_0 be the corresponding price for bread. Suppose a cartel operating in the flour market succeeds in raising flour prices to w_1 . The cartel has an indirect effect on the price of bread, which increases up to p_1 .

Figure 1-3: Harm caused by the wheat flour cartel



⁵⁸ The Tribunal imposed a fine of about R89 million which amounted to 10 per cent of the affected turnover of its 2010 milling division. See Commission press release, 13 December 2012 Competition Commission settles milling case with Foodcorp. Available at <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Commission-settles-milling-case-with-Foodcorp-.pdf>

⁵⁹ Note that this figure assumes that there is an input cost taking monopoly baker with no marginal cost beyond the linear wholesale price of flour. The derived demand for flour is then the marginal revenue curve in relation to the demand of bread.

The cartel in the market for flour harms the independent bakeries (who demand flour in order to produce bread), industrial flour purchasers (industrial flour is sold to industrial users in bulk and is not available to end-customers) as well as the indirect purchasers of flour (consumers who purchase bread for their consumption).

Assume, there is Bertrand competition in the bakery market and bakeries belonging to the flour cartelists are not affected by the flour cartel while independent bakeries are affected. Therefore, there is no pass on effect. Direct customers such as independent bakeries and industrial users are harmed because they are forced to pay $(w_1 - w_0)$ more for the q_1 units purchased from the cartel and because the volume they sell in the end product market falls from q_0 to q_1 , which implies a loss of profits equal to $(p_0 - w_0)(q_0 - q_1)$. In the absence of the pass on effect, the harm caused by a cartel for direct customers is the sum of areas a , b , and c .

The harm caused by the cartel on direct customers is reduced if they can pass-on part of the flour price increase to their own customers by increasing the price charged for bread from p_0 to p_1 . As shown in Figure 1-3 the harm caused by the flour cartel on the direct customers of flour is given by the sum of areas a , b and c minus area d . Area a measures the flour cartel overcharge. The combined area b and c measures the loss of profits associated with the reduction in volume caused by the cartel. Area d measures the pass-on effect.

Consumers of bread pay a price p_1 when they would have paid p_0 in the absence of the cartel. Consumer welfare in market for bread also falls as a result of the reduction in volume from q_0 to q_1 . Observe that area a , now accrues to the cartel. Area a , is not therefore a loss for society. It used to belong to the direct customers, it now belongs to the cartel. Similarly, area d , is not a loss for society. It used to belong to the consumers (bread buyers), it now belongs to the “direct customers”. So areas a and d are not part of the social loss created by the cartel. These two areas have simply changed hands. This is not the case, however, with areas b , c and e which represent the true harm created by this cartel on the South African economy.

When the flour and bread cartels were in operation, there is an open question as to how much of the collusive mark-up was realised in the flour mark-up and how much in the bread mark-up. In principle, collusion could have taken place exclusively in the flour market, that is, maximal surplus from bread consumers could have been extracted by flour millers raising the price of flour and then competing (with this artificially high cost of flour) in the bread market. Given the lack of substitute for flour in the baking of bread, such a collusive scheme could be effective. However, it is probably not difficult to find reasons for why the cartel may not want to raise the price of flour too much and to instead collude both in the milling and baking market.

A firm found guilty in a cartel case and sued for damages may invoke the passing-on defence, that is, its (direct) buyer passed on to its own customers the higher price. The degree of pass-on depends on the structure of the market. If the buyer faces Bertrand competition downstream and its rivals were not affected by the cartel, the pass-on will be 0. If there is Bertrand competition downstream and all buyers were affected by the cartel, the pass-on will be 100 per cent. If the buyer is a monopolist downstream, then the pass-on will be partial (under linear demand assumptions, it turns out to be 50 per cent).⁶⁰ This also opens the issue of possible claim by indirect customers, who would have been harmed by the pass-on

The analysis below assumes that there is no pass on effect in the independent bakery market. This assumption is reasonable because the independent bakeries were excluded from the bread cartel and the vertically integrated cartel is known to have engaged on predatory pricing strategy to drive out independent bakeries of the bread market.⁶¹ In addition, Pioneer Foods admitted in November 2010 that this conduct impeded small independent bakeries from expanding within the market as part of the Pioneer Foods consent order concluded by the Tribunal.

4. Estimating wheat flour price overcharges to independent bakeries

A. METHODS OF CALCULATING OVERCHARGES

There are different methods that have been proposed to estimate overcharges in the context of cartel cases.⁶² First, comparator-based methods take the data on economic variables, such as prices, sales volumes, or profit margins, observed when there is no cartel or in markets where there is no cartel as an indication of the hypothetical world without the cartel.⁶³ An alternatively method combines the comparisons over time and across markets and is sometimes called the ‘difference in differences’ method because it looks at the development of the relevant economic variable (e.g. the price) in the alleged cartelised market during a certain period (difference over time on the cartelised market) and compares it to the development of the same variable during the

⁶⁰ See Verboven and van Dijk (2009). There is also a huge empirical literature on the pass-on (also called pass-through), especially in macro and international trade.

⁶¹ Essay 3 provides direct evidence of predation through below-cost pricing in the cartelised South African bread industry by comparing prices to average variable costs.

⁶² See also European Commission (2009) and (2011).

⁶³ Various techniques are used to implement these methods. Simple techniques include individual data observations, averages and interpolation. The implementation of these methods is sometimes refined by the use of econometric techniques, in particular, regression analysis.

same time period on an unaffected comparator market (difference over time in the market without a cartel). The comparison shows the difference between these two differences over time.⁶⁴

Second, cost-based methods are based on the observation that changes in price should reflect changes in costs. These methods use some measure of production costs per unit, and adding a mark-up for a profit that would have been ‘reasonable’ in the but-for scenario. These methods can only be used in the estimation of overcharges if detailed production cost data are available for analysis. Third, a variation of comparator-based and cost-based methods is the constant margin approach. Instead of analysing prices, variable costs become the focus of the analysis. The constant margin approach assumes that cartel members earned profit margins from non-cooperative conduct before and after the period of the cartel. The but-for benchmark is an implicit gross margin that remains constant for the affected period. Costs of production are collected for the pre-cartel, cartel and post-cartel periods.

Finally, simulation methods draw on economic models of market behaviour. These methods use direct information on the cartelised market to specify an economic equilibrium model that explicitly specifies the demand and cost conditions, and the nature of oligopolistic behaviour in the market under consideration.⁶⁵ When the model is completely specified, it is possible to carry out counterfactual simulations (see Verboven and van Dijk (2009)).⁶⁶ The simulation approach makes it possible to compute both the cartel margins and the competitive (or non-cooperative) margins without relying on any cost data. In practice, the approach can be used in combination with the cost based approach. This would amount to computing the competitive but-for price using accounting cost data, plus an allowance for the competitive margin based on a simulation model.

B. THE REDUCED FORM MODEL

The price overcharge by a cartel is calculated as the difference between the cartel’s price and the price that would have existed in a counterfactual or but for world without the cartel. The method for assessing the overcharges adopted consists of comparing the actual situation during the period when the flour cartel produced anticompetitive effects with the situation on the same market after

⁶⁴ One advantage of the difference in differences method is that it can subtract out changes unrelated to the cartel that occurred during the same time period as the cartel.

⁶⁵ The simulation model should be constructed in such a way that it replicates (a) the most significant factors influencing supply and (b) demand conditions. These factors would be expressed as a set of equations in which a number of parameter values need to be included.

⁶⁶ For example as cited in Connor (2007), Raper et al. (2000) use simulation to determine the degree of monopsony power exercised by cigarette manufacturers in the U.S. market for leaf tobacco; they also determine the absence of countervailing monopoly power by sellers in that market. de Roos (2006) provides an example of how well dynamic simulation can fit the facts of a cartel, in this case the global vitamin C conspiracy.

the cartel ceased.⁶⁷ One advantage comparing, over time, data from the same geographic and product market is that market characteristics such as the degree of competition, market structure, costs and demand characteristics may be more comparable than in a comparison with different product or geographic markets.

The reduced form model uses data on prices and the explanatory variables from both the cartel and non-cartel periods (see for example, Nieberding (2006), Rubinfeld (2008), Van Dijk and Verboven (2009), and McCarry and Rubinfeld (2011)).⁶⁸ The model describes the equilibrium price that results from the interaction of demand and supply (or cost) forces in the flour industry, with the output variable having been removed by substitution and is given by:⁶⁹

$$p_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 S_{it} + \beta_3 D_i + \varepsilon_{it} \quad (1)$$

p_{it} represents the price of flour at time t in region, i , and C is a set of variables that affect per-unit costs (wheat prices). S is a group of variables affecting demand (the prices of substitute products). The cost and demand-shift variables included are assumed to be exogenous, since they are presumed to be determined independently of price and therefore unaffected by it (see Rubinfeld (2008)).⁷⁰

Included within the explanatory variables is a dummy variable, D . The dummy variable assumes the value of one for observations during the cartel period and zero for observations outside the cartel period. The estimated coefficient of the dummy variable if found to be significant provides an estimate of the average overcharge due to the cartel. Put differently, the dummy variable represents a “shift” in the price line under study rather than causing a change in its shape (or slope).

⁶⁷ In principle, three different points of reference that can be used for the comparison over time; (1) An unaffected pre-cartel period (comparison ‘before and during’ the cartel. A comparison of the prices in the same market, before and during the cartel. A complication to this assessment in the flour industry in South Africa is that the industry has always been cartelised, establishing the before period is difficult. Recall that the industry was regulated from 1937 to 1996); (2) An unaffected post-cartel period (comparison ‘during and after’ the cartel. A comparison of the prices in the same market during and after the cartel; and (3) Both an unaffected pre- and post-cartel periods (comparison ‘before, during and after’ the cartel).

⁶⁸ Some of the advantages of using a reduced form model for estimating damages include, (1) the fact that data requirements are limited to time series of the respected cartelized product; (2) the economic concept behind the approach is simple and straightforward; (3) the estimation of the over-charge itself is relatively easy to implement; and (4) it is not necessary to make any assumptions on industry conduct absent the cartel.

⁶⁹ See Appendix AI.

⁷⁰ Variables related to market demand appear in the model because the reduced form model tries to explain the equilibrium price.

However, as discussed by Finkelstein and Levenbach (1983), if prices are affected in more varying and complex ways, the use of one scale dummy variable for the entire cartel period (which assumes that the cartel added a fixed Rand or percentage amount to price during the conspiracy) may be too simple an approach (see also Nieberding (2006)).⁷¹ When the duration of the cartel is long and the necessary data is available, the more appropriate way to evaluate the overcharges is to use a forecasting approach. In this approach, one estimates a regression model that explains prices using only data for the control period in which competition was not restricted. Thereafter, the regression model is used to predict but-for prices in the cartel period.

The error term reflects random shifts in demand, marginal cost, or conduct by the market participants. The error term is assumed to be independent of, and therefore uncorrelated with, all of the right-hand side variables. Further, we note that there are demand and cost shifters which are only observable to the firms. These unobservable characteristics will be captured by the error term in the empirical model.

For a number of reasons, the dummy variable approach adopted to estimate overcharges is likely to underestimate the true harm caused by price fixing.⁷² First, the dummy variable approach requires that the cartel period is precisely defined. Because of data availability problems, I have used data from September 2003, while I know the cartel began as early as 1999. This suggests that the cartel period was longer than the period identified. Therefore, the estimated cartel overcharge may under-estimate the true cartel overcharge. Furthermore, the effects of the cartel may last longer than the cartel itself. This is because the members of the cartel may be able to collude tacitly after the cartel ceases to exist. A long cartel generates focal points for prices that can facilitate tacit coordination among the members of a tight oligopoly.

Second, as shown by Basso and Ross (2010), the overcharge measure is likely to underestimate the harm caused by a cartel on direct and indirect purchasers as it omits potentially significant volume effects. Third, the dummy variable approach measures the price overcharge as the difference between the average price observed in the cartel period and the average price observed after the cartel period, provided that such a difference is statistically significant. However, the use of standard statistical significance criteria may lead to the conclusion that the cartel may not have had a material effect on prices, when in fact the opposite is true.

⁷¹ Another shortcoming of the reduced form model, is the fact that the omission of relevant variables can bias the results. Omitted variables that are correlated with the independent variables would create a bias in the regression coefficients. Furthermore, the results might not be robust to the choice of functional form.

⁷² See Andreu, Padilla and Watson (2011).

C. DATA AND RESULTS

The dataset contains information on monthly wheat prices, flour prices to the independent bakery channel and other variables from September 2003 to December 2008 for Gauteng and Western Cape provinces. Table 1-1 presents some of the descriptive statistics and variable description.

The dataset is constructed using a combination of both public and private data. The private data is from the National Chamber of Milling (“NCM”) and the firms involved in the cartel. The private dataset includes prices and costs. We include in the dataset monthly consumer price index data from Statistics South Africa (“Stats SA”). This data captures monthly food prices and is provided by the South African Grain Information Service (“SAGIS”) and is public. It contains nominal prices of substitutes such as oats. Wheat flour can be substituted with oat flour in baking bread and other products.

Table 1-1: Descriptive statistics

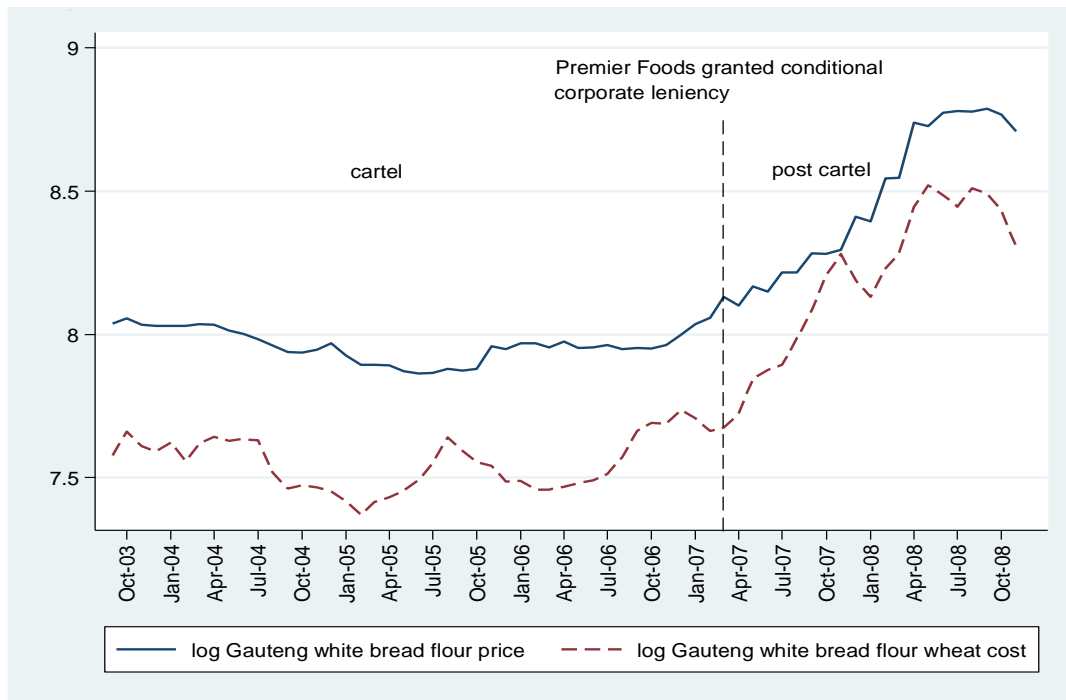
Variable	Obs	Mean	Std. Dev.	Description
GA_WF_P	63	3553.5	1213.1	Represents the average monthly real price per tonne of white bread flour in Gauteng (in Rands)
GA_WF_WC	63	2519.1	1028.1	Represents the real wheat cost per tonne of white bread flour in Gauteng (in Rands)
GA_BF_P	63	3516.5	1129.9	Represents the average monthly real price per tonne of brown bread flour in Gauteng (in Rands)
GA_BF_WC	63	2325.9	944.8	Represents the real wheat cost per tonne of brown bread flour in Gauteng (in Rands)
GA_CF_P	63	3685.2	1166.3	Represents the average monthly real price per tonne of cake flour in Gauteng (in Rands)
GA_CF_WC	63	2661.4	1089.7	Represents the real wheat cost per tonne of cake flour in Gauteng (in Rands)
WC_WF_P	63	3298.6	1202.0	Represents the average monthly real price per tonne of white bread flour in Western Cape (in Rands)
WC_WF_WC	63	2113.2	1014.2	Represents the real wheat cost per tonne of white bread flour in Western Cape (in Rands)
WC_BF_P	63	3195.4	1106.1	Represents the average monthly price per tonne of brown bread flour in Western Cape (in Rands)
WC_BF_WC	63	2115.8	1015.4	Represents the real wheat cost per tonne of brown bread flour in Western Cape (in Rands)
WC_CF_P	63	3823.2	1149.3	Represents the average monthly real price per tonne of cake flour in Western Cape (in Rands)
WC_CF_WC	63	2988.7	1143.3	Represents the real wheat cost per tonne of cake flour in Western Cape (in Rands)
Safexp	63	2081.7	850.5	Represents the average monthly real SAFEX Randfontein wheat price per tonne (in Rands)
Oats	63	9.9	1.1	Represents the real price of oats per 500g (in Rands)
Dcartel	63	0.6	0.5	1 if in cartel period and 0 otherwise

The wheat cost is calculated using the average monthly SAFEX Randfontein wheat price per tonne (i.e. monthly average using daily SAFEX prices, lagged by 3 months to take into account of mills buying wheat on forward contracts) plus the SAFEX transport differential which is adjusted annually, less the average monthly chop (offal) price adjusted for the extraction rate (for example, for cake flour the extraction rate 70 per cent per tonne of milled wheat).⁷³ The extraction rate is obtained from the NCM. Other costs are obtained from the firms' annual submission to the NCM's costing survey data. These costs are averaged across the regions for all of the firms and include packaging, distribution, production and marketing costs per tonne of milled wheat.

The flour prices are obtained using the average monthly transaction price for a 12.5kg bag of flour sold to the independent customer channel, multiplied by 80 to convert them to a price per tonne, adjusted for an extraction rate of approximately 70 per cent per tonne of flour as obtained from the NCM. The price and cost data is deflated using the South African consumer price index which is provided by Stats SA. The base year for the deflator of real prices is 2005. The proved existence of the cartel suggests that independent bakeries paid a high price for flour and were therefore harmed by the cartel. Figures 1-4 to 1-7 show the development of flour prices and wheat costs per tonne of flour from September 2003 to December 2008 in Gauteng and Western Cape provinces.

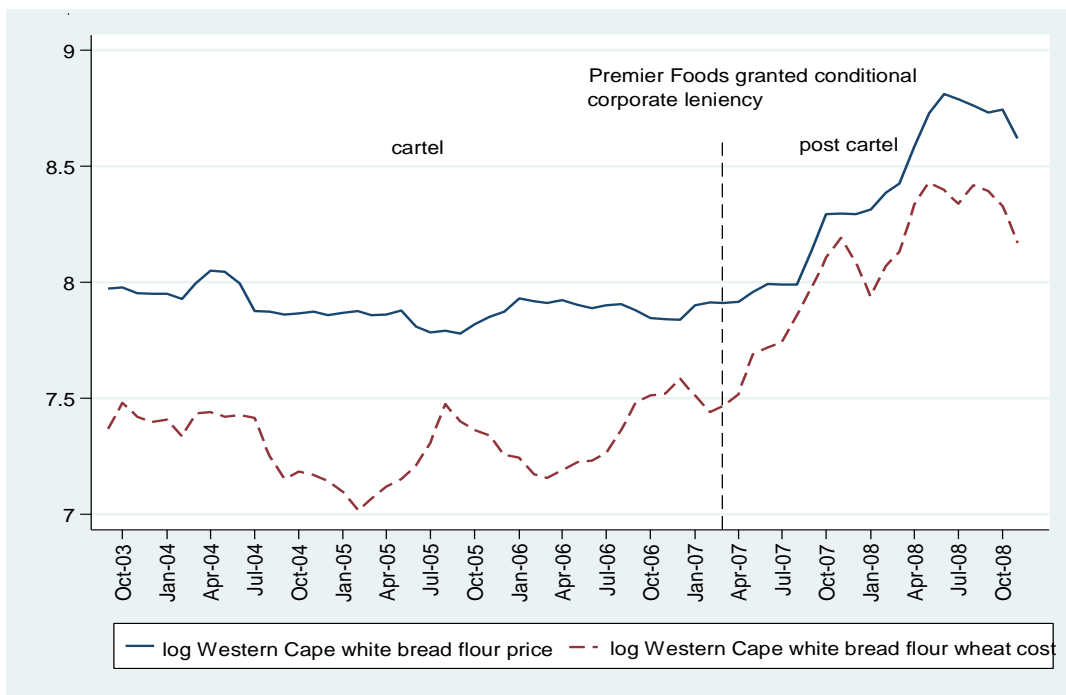
⁷³ All SAFEX prices are Randfontein-based, this means that if a producer can deliver or a miller can accept delivery at Randfontein, they will receive or pay the SAFEX price for the delivery month contract (the spot price). The delivery usually takes place at points across the various producing regions, all spot prices are SAFEX adjusted prices. For example if the transport costs between Randfontein and the silo where a producer chooses to deliver is R100/tonne, the delivery price for the producer will be equal to the Randfontein price (the delivery month contract price) minus the R100/ton transport cost. The buyer will now collect the maize from the relevant silo at the SAFEX price minus the R80/ton. These transport cost differentials are calculated every year and are available from SAFEX.

Figure 1-4: Real Gauteng white bread flour price, September 2003 to December 2008



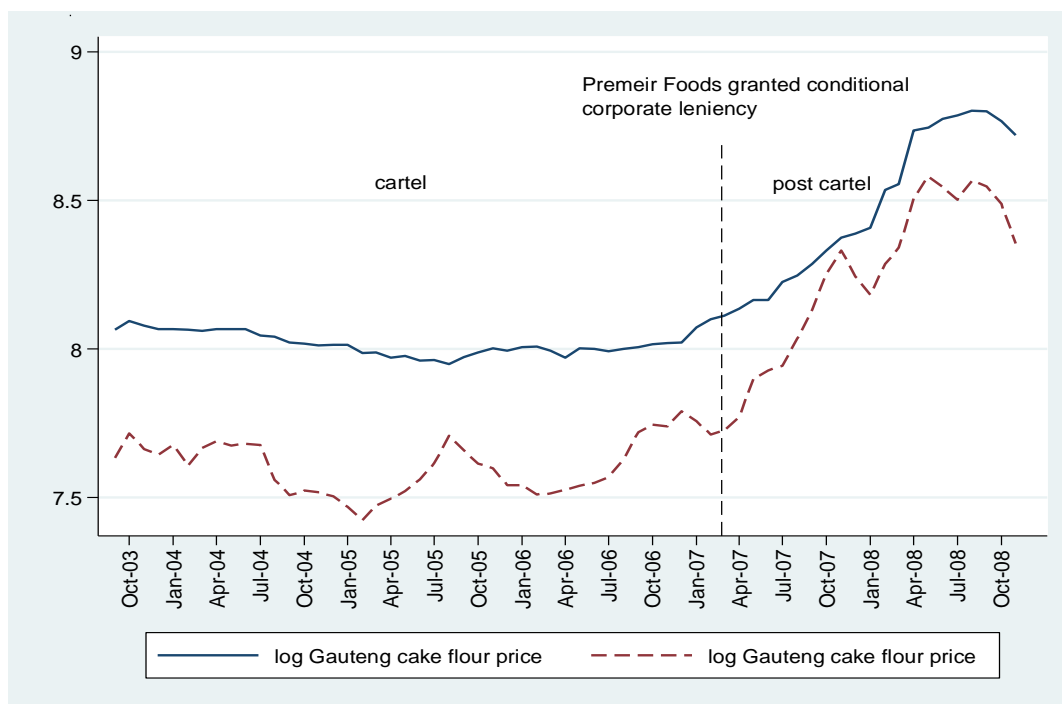
Source: own calculations

Figure 1-5: Real Western Cape white bread flour price, September 2003 to December 2008



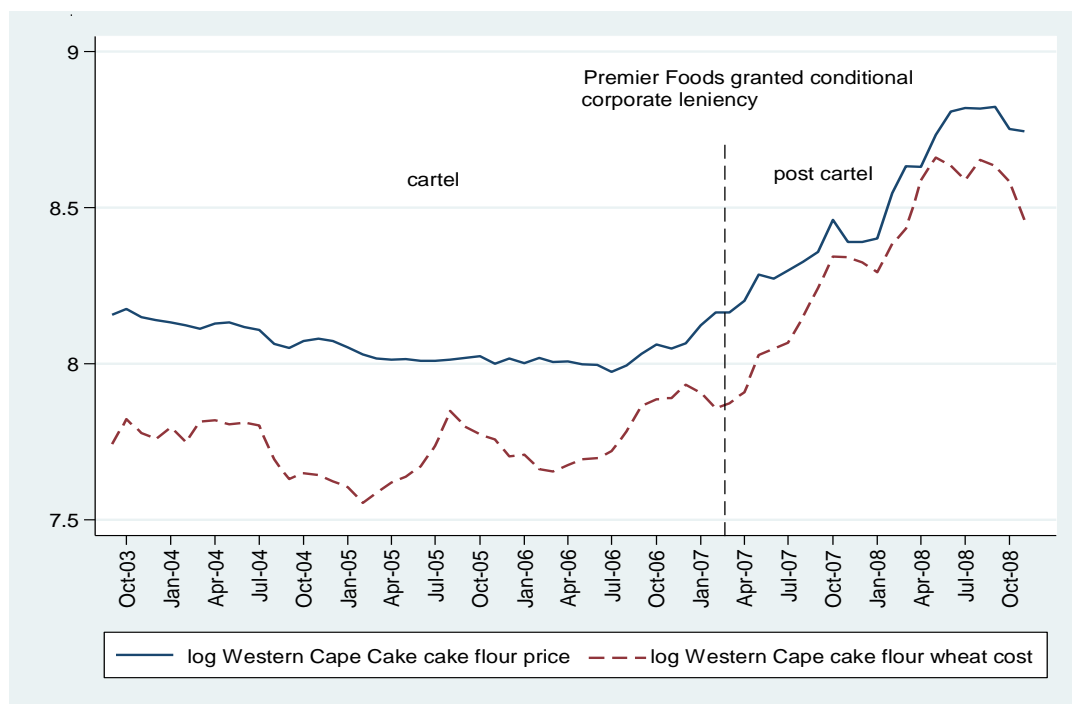
Source: own calculations

Figure 1-6: Real Gauteng cake flour price, September 2003 to December 2008



Source: own calculations

Figure 1-7: Real Western Cape cake flour price, September 2003 to December 2008



Source: own calculations

Figures 1-4 to 1-7 provide a simple comparison of prices during the period of the alleged cartel with the prices in the period after the cartel, on the assumption that the latter provide a reasonable approximation of price levels in the absence of the cartel. While this approach is appealing because of its simplicity and visual transparency, it is subject to a number of potentially significant pitfalls. Observations of the likely impact of the cartel are difficult to make from the figures. Post cartel, flour prices increased substantially up to May 2008 following the increase in wheat prices, after which wheat prices began to fall while the flour price remained stable and sticky downwards. Note as well that although prices increased after the cartel, the gap between price and cost fell.

There are several explanations for this observation. First, it could be a result of asymmetric price transmission of cost changes whereby price responds quicker to cost increases than to cost decreases. The literature reveals that “rockets and feathers” phenomenon has been observed for many agricultural markets.⁷⁴ Second, tacit collusion is more likely after explicit collusion, because firms may have learned ways to organise themselves in manner in which tacit collusion is the outcome during the explicit cartel (see Connor (2004)). Connor’s argument suggests that prices decline after the explicit cartel but just not to competitive levels, other things equal. If the cartel is not perfectly colluding and is not motivated by the desire to maximise joint profits but rather socialisation, it is possible that the tacit collusion outcome results in higher prices. Alternatively, Harrington (2004) shows that the likelihood of damage assessment based on post-cartel prices may in fact create an incentive for firms to price above the non-collusive price in the post-cartel period in order to complicate calculations of damages. This strategic behaviour may lead to an underestimation of cartel damages if the assessment is based on post-cartel prices.⁷⁵

The arguments above support the use of pre-cartel price information as the more appropriate benchmark. However, it is impossible to get pre-cartel price data for flour given the history of regulation in the flour industry in South Africa. Ideally the benchmark period selected for identifying but for prices should capture long-run equilibrium prices. In addition, it is important

⁷⁴ See for example, Meyer and von Cramon-Taubadel (2004), Frey and Manera (2007) and Cutts and Kirsten (2006).

⁷⁵ While private antitrust class actions have historically been weak in South Africa, the South African Constitutional Court recently ruled in favour of the companies looking to initiate a class action against various bread producers. Note that the firms involved in the bread cartel are the same firms involved in the flour cartel. The Constitutional Court judgment overturned two previous rulings by the Western Cape High Court as well as the Supreme Court of Appeal that denied the distributors the ability to bring a class suit against Pioneer Foods, Tiger Brands and Premier Foods who were found guilty by the Competition Tribunal for price-fixing. This gives the bread distributors another chance to sue the cartellists. The Constitutional Court referred the case to the Western Cape High Court to hear the argument again. See *Children’s Resource Centre Trust v Pioneer Food* (50/2012) [2012] ZASCA 182 (29 November 2012) and *Mukaddam v Pioneer Food*(49/12) [2012] ZASCA 183 (29 November 2012). See also <https://www.competitionpolicyinternational.com/south-africa-court-overturns-class-action-denial-for-bread-distributors/>

that the conditions under which prices were set before, during and after the cartel be clearly understood. If prices are un-representative during the selected benchmark period then the counterfactual prices generated by this approach may be misleading.⁷⁶

I estimate a log-linear model. As discussed above, only the relevant cost and demand variables are included in the empirical analysis. Notice that I do not include the quantity variable itself as an independent variable but instrument quantity by using the price of substitutes. This is done to avoid the inter-dependence of price and demand. From an econometric perspective, ignoring the interdependence can cause serious consequences in the form of biased coefficients. The model is expressed in its implicit form as:

$$\ln(\text{flour price}) = \beta_0 + \beta_1 \ln(\text{wheat cost}) + \beta_2 \ln(\text{Oats price}) + \beta_3(\text{cartel dummy}) + \varepsilon$$

The explanatory variables included in the model aforementioned and their definitions are presented in Table 1-1.

Table 1-2 shows the results of the log-linear regression specification using OLS. The R-squared value of 0.909 (Column 1) indicates that 90.9 per cent of the total variation in the price of brown bread flour explained by the explanatory variables in the model. The wheat price (cost shifter) is significant and positively related to the price of flour. This is accordance with priori expectations. The regression results show that a 1 per cent increase in the price of wheat leads to a 0.479 per cent increase in the price of brown bread flour in Western Cape. The results show that the price difference between the cartel period and the non-cartel period (that is, the price overcharge) is given by the $\exp(0.217) - 1$ and is equal to 24.2 per cent for brown bread flour (column 1).⁷⁷ The Western Cape estimated results also reveal an overcharge of the value of $\exp(0.275) - 1 = 31.2$ per cent for white bread flour (column 2).

Table 1-3 shows the estimated results of brown, white and cake flour in Gauteng, respectively. In line with priori expectations, all the cost shifters are positive and significant in Table 1-3. For example, a 1 per cent increase in the price of wheat leads to a 0.513 per cent increase in the price of Gauteng brown bread flour. The overcharge is of the value of $\exp(0.0973) - 1 = 10.2$ per cent for

⁷⁶ This approach assumes that the selected benchmark prices would have been constant during the period of the cartel which implicitly assumes that the key determinants of pricing conduct would have remained entirely unchanged during the period of the cartel as compared to the selected benchmark period. This is a strong assumption and may be difficult to justify where the cartel spans a significant time period during which demand and supply conditions are likely to have changed.

⁷⁷ In the logarithmic specification, the approximated price overcharge follows from: $\log \frac{P_{\text{cartel}}}{P_{\text{non cartel}}} = \beta_3$, $\frac{P_{\text{cartel}}}{P_{\text{non cartel}}} = \exp(\beta_3)$ and therefore $\frac{P_{\text{cartel}} - P_{\text{non cartel}}}{P_{\text{non cartel}}} = \exp(\beta_3) - 1$.

white bread flour and the overcharge is of the value of $\exp(0.128)-1 = 13.7$ per cent for cake flour.

Table 1-2: Western Cape flour markets regression analysis (log –linear model)

VARIABLES	(1) lnWC_BF_P	(2) lnWC_WF_P	(3) lnWC_CF_P
lnWC_BF_WC	0.479*** (0.0704)		
lnWC_WF_WC		0.462*** (0.0805)	
lnWC_CF_WC			0.548*** (0.0709)
Dcartel	0.217*** (0.0593)	0.275*** (0.0650)	0.0538* (0.0316)
lnOats	1.580*** (0.286)	1.982*** (0.322)	0.895*** (0.273)
Constant	0.652 (0.642)	-0.154 (0.666)	1.780*** (0.402)
Observations	63	63	63
R-squared	0.909	0.899	0.938

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1-3: Gauteng flour markets regression analysis (log –linear model)

VARIABLES	(1) lnGA_BF_P	(2) lnGA_WF_P	(3) lnGA_CF_P
lnGA_BF_WC	0.513*** (0.108)		
lnGA_WF_WC		0.581*** (0.0789)	
lnGA_CF_WC			0.564*** (0.0687)
Dcartel	0.0401 (0.0527)	0.0973* (0.0558)	0.128*** (0.0435)
lnOats	0.968** (0.423)	1.139*** (0.321)	1.121*** (0.262)
Constant	1.942*** (0.594)	0.954 (0.576)	1.117** (0.469)
Observations	63	63	63
R-squared	0.846	0.945	0.950

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In equation (1) above I have assumed that the explanatory variables have the same impact on the price of flour during and after the cartel regime. However, this assumption may be unrealistic, because the demand and cost shifters will have different impacts on price in different competitive regimes, which, if not properly taken into account, results in biased parameter estimates, and thus

in the estimated impact of the cartel. For example, during non-collusive regimes other than perfect competition, firms are wary of increasing their prices as a result of higher costs. This is because, if their rivals do not follow suit, increasing price as a result of higher costs will result in a loss of market share. Conversely, during the cartel period, firms may find it easier to pass-on cost increases relative to non-collusive regimes.⁷⁸

Put differently, with collusion, a firm faces less uncertainty regarding the reactions of its rivals and this may make it easier to pass-on a cost increase. Should this be the case, one method of capturing these dynamics is to estimate a version of equation (1) where the parameters capturing the sensitivity of prices to costs are allowed to vary across competitive regimes. Accordingly, the cost shifter is interacted with the cartel dummy and the model can be written as follows:

$$p_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 S_{it} + \beta_3 D_i + \beta_4 C_{it} D_i + \varepsilon_{it} \quad (2)$$

It is interesting to note that all the interaction terms are negatively signed and significant. The coefficient of the multiplicative term, $C_{it} D_i$ actually measures the difference in the effect of wheat costs on the flour price between the cartel period and the non-cartel period; it is not a measure of the effect for the cartel period only. To illustrate using the results for Western Cape province brown bread flour prices (Column 1 in Table 1-4), the effect of wheat costs on the flour price during the cartel period is equal to 0.148 per cent (i.e. $-0.614 + 0.762$).⁷⁹ If we value the interaction at the (average) value taken by each variable over the cartel period, the cartel overcharge is positive and is estimated at about 35 per cent of the observed price. For white bread flour and cake flour in Western Cape province, the cartel overcharge is estimated at about 42 per cent and 32 per cent respectively.⁸⁰

⁷⁸ This is especially true if the firms have asymmetric cost structures.

⁷⁹ Suppose we want to compare the effect of wheat costs on the flour price between the cartel period (D_i) and the non-cartel period (F_i). Equation 2 can be specified as follows: $p_{it} = \theta_0 + \theta_1 X_{it} + \theta_2 C_{it} F_i + \theta_3 C_{it} D_i + \varepsilon_{it}$, where X_{it} is a vector of other explanatory variables and θ_1 is the corresponding vector of coefficients. $D_i + F_i = 1$. Eliminating F_i through substituting, gives the base specification of the model: $p_{it} = \theta_0 + \theta_1 X_{it} + \theta_2 C_{it} M_i + (\theta_3 - \theta_2) C_{it} D_i + \varepsilon_{it}$. The two models are mathematically equivalent but there are differences in interpreting the results. By dropping out F_i which now serves as the base, the coefficient of $C_{it} D_i$ it represents the differential effect of the wheat costs during the cartel period over the non collusion period. Thus, the interpretation of results is less straightforward for the base approach.

⁸⁰ While for Gauteng province, the estimated overcharge for white bread flour and cake flour is at about 24 per cent and 33 per cent respectively.

Table 1-4: Western Cape flour markets regression analysis (log –linear model)

VARIABLES	(1) lnWC_BF_P	(2) lnWC_WF_P	(3) lnWC_CF_P
lnWC_BF_WC	0.762*** (0.101)		
lnWC_BF_WC*D	-0.614*** (0.112)		
lnWC_WF_WC		0.839*** (0.102)	
lnWC_WF_WC*D		-0.732*** (0.120)	
lnWC_CF_WC			0.761*** (0.0812)
lnWC_CF_WC*D			-0.511*** (0.107)
Dcartel	4.752*** (0.851)	5.694*** (0.907)	4.034*** (0.826)
lnOats	0.739** (0.338)	0.904** (0.347)	0.367 (0.289)
Constant	0.403 (0.725)	-0.584 (0.747)	1.282*** (0.420)
Observations	63	63	63
R-squared	0.937	0.937	0.951

Robust standard errors in parentheses,

*** p<0.01, ** p<0.05, * p<0.1

Table 1-5: Gauteng flour markets regression analysis (log –linear model)

VARIABLES	(1) lnGA_BF_P	(2) lnGA_WF_P	(3) lnGA_CF_P
lnGA_BF_WC	0.651*** (0.160)		
lnGA_BF_WC*D	-0.350 (0.259)		
lnGA_WF_WC		0.737*** (0.109)	
lnGA_WF_WC*D		-0.405*** (0.128)	
lnGA_CF_WC			0.761*** (0.0848)
lnGA_CF_WC*D			-0.538*** (0.101)
Dcartel	2.670 (1.932)	3.163*** (0.973)	4.238*** (0.779)
lnOats	0.613 (0.582)	0.709* (0.382)	0.589* (0.296)
Constant	1.685*** (0.603)	0.717 (0.615)	0.782 (0.518)
Observations	63	63	63
R-squared	0.850	0.951	0.963

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In equations 1 and 2, I assumed that the flour price does not depend on past prices. If I relax this assumption and assume that the flour price does not adjust instantaneously to changes in market conditions. This is because even after controlling for contemporaneous and exogenous market factors, current price (p_{it}) may still depend on past prices (e.g., p_{it-1} , etc.). To control for this, I allow for a presence of a lagged dependent variable. For example, incorporating P_{it-1} into equation 1 yields,

$$p_{it} = \beta_0 + \beta_1 C_{it} + \beta_2 S_{it} + \beta_3 D_i + \beta_4 p_{it-1} + \varepsilon_{it} \quad (3)$$

Table 1-6 and Table 1-7 show that p_{it-1} is significantly correlated to current price, P_{it} , while its inclusion does not significantly perturb the sign and significance of the other included independent variables. The long run equilibrium price p_e is estimated by setting $p_e = p_t = p_{t-1}$. The long run effect of the cartel on the equilibrium price is given by the expression $\frac{\Delta \ln p_e}{\Delta \ln Dum_t} = \frac{\beta_3}{1-\beta_4}$. To illustrate using the results for Western Cape province brown bread flour (Column 1 in Table 1-6), the long run effect of the cartel on the equilibrium price is approximately 27.6 per cent. If I consider white bread flour, the long run effect of the cartel on the equilibrium price is approximately 36 per cent. While for Gauteng province cake flour, the long run effect of the cartel on the equilibrium price is approximately 13 per cent.

A common problem in most empirical studies using time series data is due to the time-series properties of the data.⁸¹ For example, all variables may be similarly trending so that any relationship between them may simply be because each is growing over time.⁸² The concern in using non stationary data is that a spurious regression may be performed which generally overstates how good is a model's "fit", as well as makes independent variables appear to be more significant than they actually are in explaining variation in the dependent variable.

One method to account for the presence of non stationarity in the data is the error correction model (see Nieberding (2006)). The error correction model uses data that are expressed as first differences, but also to allow for short-run dynamics (by incorporating lags of the variables), as

⁸¹ Nieberding (2006) explains that a stochastic process which generates a time series is said to be stationary if its mean is constant over time, and exhibits a constant and finite variance so that "shocks" only have transitory effects. Time series data that violate these stationarity conditions are termed "non stationary" and often exhibit an upward or downward trend without reversion to a constant mean, and any "shock" will have a lasting impact on future values of this series. Two or more nonstationary series are cointegrated if they have a linear combination that is stationary. If the nonstationary time series to be used in a regression are cointegrated, then regression results containing these series may be meaningful (and not spurious).

⁸² While a complete discussion of stationarity, the related concept of cointegration and the formal statistical tests used to diagnose such phenomena is not necessary for the aims of this essay, suffice it to say that regressions containing nonstationary time series may produce spurious results (e.g., variables are related only through their correlation with an omitted variable).

well as the long-term relationship between the equilibrium price being modelled and its actual value (by including an error correction term).

Table 1-6: Western Cape flour markets regression analysis (log –linear model

VARIABLES	(1) lnWC_BF_P	(2) lnWC_WF_P	(3) lnWC_CF_P
lnWC_BF_WC	0.170* (0.0892)		
lag_lnWC_BF_P	0.598*** (0.134)		
lnWC_WF_WC		0.171* (0.0988)	
lag_lnWC_WF_P		0.566*** (0.127)	
lnWC_CF_WC			0.242* (0.131)
lag_lnWC_CF_P			0.501*** (0.171)
Dcartel	0.111*** (0.0398)	0.158*** (0.0497)	0.0250 (0.0291)
lnOats	0.926*** (0.259)	1.258*** (0.320)	0.603** (0.257)
Constant	-0.240 (0.599)	-0.776 (0.562)	0.780 (0.498)
Observations	62	62	62
R-squared	0.931	0.925	0.949

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1-7: Gauteng flour markets regression analysis (log –linear model)

VARIABLES	(1) lnGA_BF_P	(2) lnGA_WF_P	(3) lnGA_CF_P
lnGA_BF_WC	-0.0200 (0.192)		
lag_lnGA_BF_P	0.881*** (0.297)		
lnGA_WF_WC		0.195 (0.138)	
lag_lnGA_WF_P		0.612*** (0.158)	
lnGA_CF_WC			0.220** (0.104)
lag_lnGA_CF_P			0.572*** (0.126)
Dcartel	0.00211 (0.0487)	0.0348 (0.0451)	0.0574* (0.0326)
lnOats	0.502 (0.386)	0.611** (0.299)	0.638*** (0.238)
Constant	-0.0214 (0.858)	0.222 (0.448)	0.289 (0.404)
Observations	62	62	62
R-squared	0.885	0.957	0.962

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

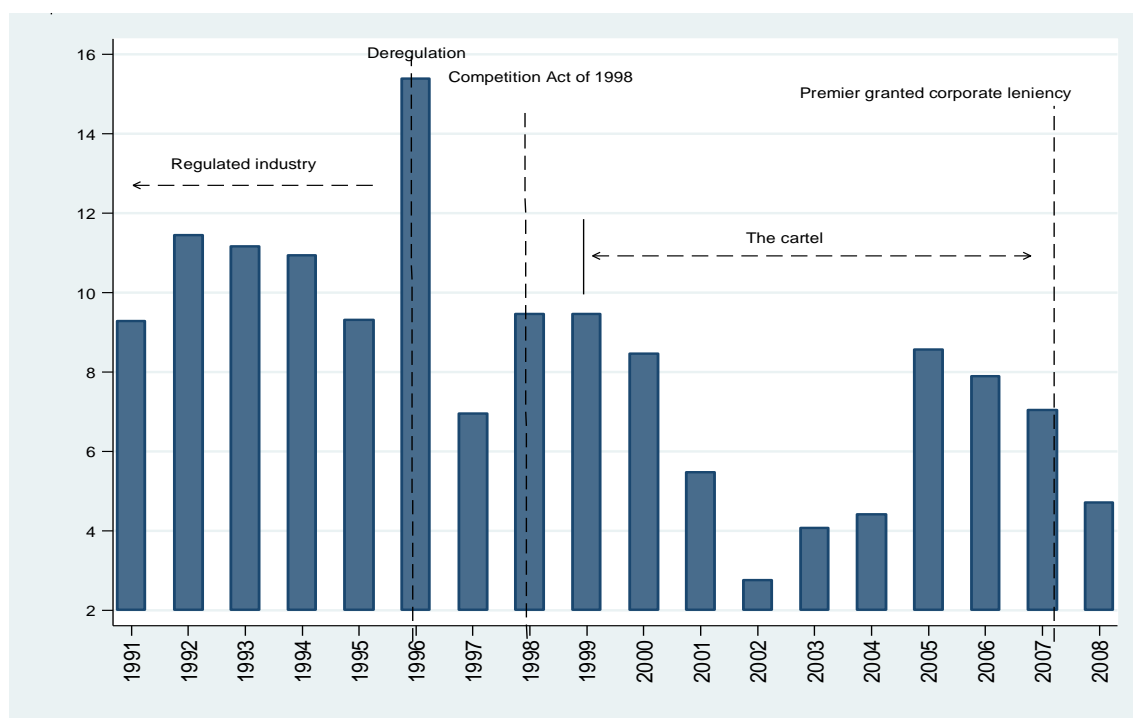
Connor (2007) suggests a margin approach as a variation on the before-and-after and cost-based methods. Figure 1-8 below shows the average percentage industry profits before, during and after the cartel. The average percentage profits on turnover are before tax and interest.⁸³ Notice that there is a drop in profits by more than half following deregulation in 1996. This may have been one motivation why the industry fearing liberalisation decided to continue with regulation, albeit private regulation, in order to restore industry profits.

A price war in 2002 could explain the drastic drop in average industry profits. As an alternative to the before and after regression results, the cartel profits in Figure 1-8 are approximately two times

⁸³ Figure 1-8 uses average EBITDA (earnings before interest, taxes, depreciation, and amortization) margins, more precisely accounting profits. Accounting profits, however, do not correspond to economic profit and consequently may be misleading in the evaluation of the firms' ability to raise price above marginal cost. An accounting profit is defined as the difference between a firm's revenues and its operating expenses (or explicit costs). In contrast, an economic profit is defined as the difference between a firm's revenues, operating expenses, and the opportunity cost of the inputs used to make the firm's sales. Economic profits account for real costs, not historical or bookkeeping costs, and the cost of using a unit of a resource is the maximum amount that a unit could earn elsewhere. Only economic profits are possibly relevant and reliable for evaluating market power. Notwithstanding the above, even economic profits are generally not a reliable proxy for market power. For example, factors unrelated to market power can influence a firm's profit margins, such as a firm's management, cost structure, and exogenous factors beyond the firm's control. See Bork and Sidak (2013).

higher during the cartel than the price war year 2002 or the post collusion year 2008. Figure 1-8 also suggests that the cartel may have experienced two episodes and that the first episode (1996-2001) was somewhat more effective in generating cartel profits than the second episode.⁸⁴

Figure 1-8: Percentage industry profits on turnover before tax and interest



Source: own calculations

How do my estimates compare with findings elsewhere? Most of the empirical studies indicate that the majority of cartels that have been studied have a positive overcharge. For example, several studies derive overcharge estimates for various past cartels in various industries and countries. Posner (2001) considers 12 cartel cases, the median amount by which the price increased is estimated at 28%. A 2002 OECD study based on a survey of cartel cases conducted by its members between 1996 and 2000, finds that the median overcharge was between 13 per cent and 16 per cent of the cartel price (with a variation from 3 per cent to 40 per cent). Werden (2003) reviews 13 other studies, and finds 21 per cent mean overcharge.⁸⁵

Connor and Lande (2006) provide a survey of cartel overcharge estimates by examining more than 500 referred journal articles, working papers, monographs and books. They find an average in the range of 31 per cent to 49 per cent and a median overcharge in the range of 22 per cent and

⁸⁴ While in the first episode the cartel held regular meetings, in the second episode the cartel held regular telephone contacts perhaps because of probability of detection concerns.

⁸⁵ See also Appendix A II.

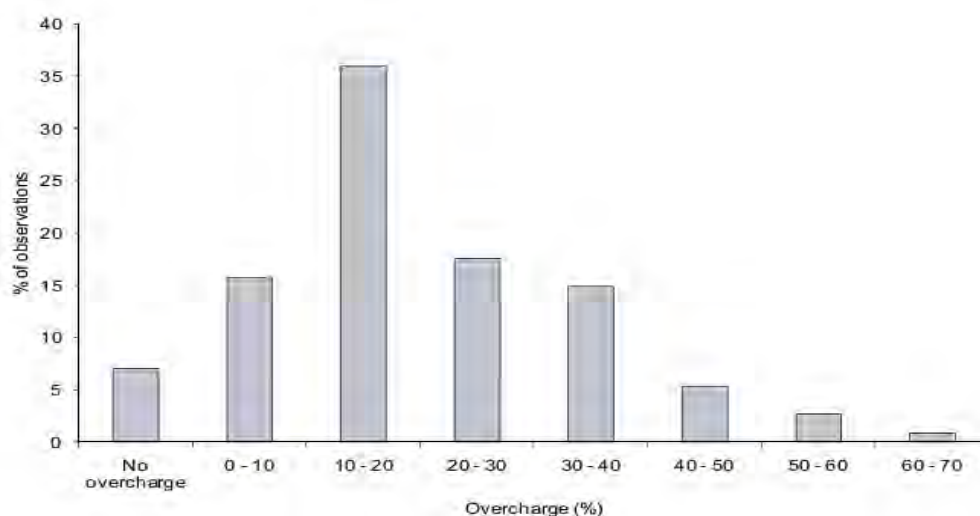
25 per cent of affected commerce. Connor and Lande then conclude that the presumption that cartels overcharge by 10 per cent is much too lenient and the current levels of cartel penalties should be increased significantly. Combe et al (2008) analysed 64 cartels prosecuted by the European Commission and argue that fines imposed against cartels by the European Commission are overall suboptimal. Levenstein and Suslow (2006), based on their review of 16 cartel case studies, calculate an average mean overcharge of 43 per cent. They find that in all cartel cases surveyed, the cartel was able to raise prices immediately following cartel formation. Oxera Consulting (2009) further examined the dataset underlying the Connor and Lande (2006) study, as well as an additional observations provided by Connor and Lande.⁸⁶ Figure 1-9 illustrates the distribution of cartel overcharges across this new dataset of 114 observations.⁸⁷ The sample includes international and national cartels that affected a wide range of different industries. The geographic spread of the sample extends to the US and Canada as well as cartels from Europe and other regions. In 93 per cent of all cartel cases considered, cartels do lead to an overcharge. Seven cartels have an overcharge of more than 50 per cent. About 70 per cent of all cartels have an overcharge of between 10 per cent and 40 per cent. According to Oxera Consulting, the median overcharge is 18 per cent of the cartel price. The mean average overcharge is around 20 per cent.

One important key limitation of all these studies is publication bias. Publication bias stems from a sample selection problem. A sample selection problems arises if observations that ought to be included in the data set are absent from the sample. Many cartels are unsuccessful in raising prices but because of publication bias are not reported upon because editors and reviewers have a strong preference for studies with statistically significant results (see Ehmer and Rosati (2009)).

⁸⁶ Oxera Consulting (2009) refined the sample of cartels examined in Connor and Lande (2006) by considering only cartels (a) that started after 1960 (thus taking into account only more recent cartels), (b) for which an estimate of the average overcharge was available (rather than only an estimate of the highest or lowest overcharge), (c) for which the relevant background study explicitly explained the method for calculating the average overcharge estimate, and (d) which were discussed in peer-reviewed academic articles or chapters in books.

⁸⁷ The 114 cartels are based on different types of collusion, including bid-rigging.

Figure 1-9: Distribution of cartel overcharges in empirical studies of past cartels



Source: Oxera Consulting analysis based on underlying Connor and Lande data and selection

5. Conclusion

The quantification of the overcharge suffered by independent bakeries in South Africa as a result of collusive behaviour requires a comparison with the position in which this group of customers would have been but for the cartel. Put differently, in calculating overcharges, I ask the question, what would have happened without the collusive behaviour? To answer the hypothetical question I need to estimate the but-for world with which then to compare with actual world. To be specific, because the flour cartel raised prices to independent bakeries, the but-for price is estimated as a reference point for comparing with the price actually paid by these customers.

It is impossible to know with certainty how the flour market would have exactly evolved in the absence of the collusive behaviour. Prices, sales volumes and profit margins, all depend on a range of factors and complex interactions between market participants that are not easily estimated. For this reason, the estimation of the hypothetical but for world relies on a number of assumptions. Hence, the calculation of overcharges is subject to considerable limits as to the degree of certainty and precision. There is no a single 'true' value of the overcharge suffered that can be determined, but only best estimates relying on assumptions and approximations.

However, that it is difficult to measure the overcharge should not lead to the adoption of arbitrary rules of thumb. The dummy variable approach is only one method of estimation. There are others, but the choice of the method to estimate overcharges depends on (1) specific set of facts about the

industry, (2) the availability and quality of data and (3) the nature of the hypotheses being tested.⁸⁸ While admittedly, estimations of overcharges are subject to assumptions. That the estimation methods are imperfect is however not a reason to discard them. Best practice suggests that whenever used, one should assess the results of each approach in light of its limitations, perform a sensitivity analysis to assess the robustness of the results and reconcile with more direct evidence available (for instance, internal documents of the cartel members on agreed price increases).

⁸⁸ The reliability and precision of the analysis depends on whether the analysis has been tackled rigorously.

A. Appendix

I. DERIVING THE REDUCED FORM PRICE AND QUANTITY EQUATION

In this appendix, I compute the derivation of the reduced form equation which shows that equilibrium prices and quantities are linear functions of both demand and supply shifters.⁸⁹ To isolate the cartel and non-cartel influences on price, one may quantify the interaction of buyers and sellers through the explicit construction of behavioural supply and demand relations in the context of a structural model. The demand curve gives the quantity that consumers would like to purchase at a given price, conditional on other variables that affect demand. The supply curve gives how much sellers are willing to sell at a given price, conditional on other supply shifters. The economic theory pertinent to the industry under study guides the specifications.

Suppose that the demand and supply model can be represented by the two estimating equations:

$$\begin{aligned} q_t^s &= \mu_0 + \mu_1 p_t + \mu_2 S_t \\ q_t^d &= \gamma_0 + \gamma_1 p_t + \gamma_2 D_t \end{aligned} \quad (\text{a1})$$

where q_t^s and q_t^d represent the quantity demanded and supplied, respectively, at time t ; p_t is market price, and D_t and S_t represent exogenous demand and supply shifters.⁹⁰ Using the equilibrium condition that supply equals demand ($q_t^d = q_t^s$), I can solve for the equilibrium price p_t . This yields a reduced-form equation that relates equilibrium price to exogenous supply and demand factors.⁹¹

$$p_t = \beta_0 + \beta_1 S_t + \beta_2 D_t \quad (\text{a2})$$

Assuming that:

$$\begin{aligned} \left(\frac{\mu_0 - \gamma_0}{\gamma_1 - \mu_1} \right) &= \beta_0 & \left(\frac{\mu_2}{\gamma_1 - \mu_1} \right) &= \beta_1 & \left(\frac{-\gamma_2}{\gamma_1 - \mu_1} \right) &= \beta_2 & (\mu_1 - \gamma_1) &\neq 0 \\ p_t &= \left(\frac{\mu_0 - \gamma_0}{\gamma_1 - \mu_1} \right) + \left(\frac{\mu_2}{\gamma_1 - \mu_1} \right) S_t - \left(\frac{\gamma_2}{\gamma_1 - \mu_1} \right) D_t \end{aligned} \quad (\text{a3})$$

⁸⁹ See also Nieberding (2006).

⁹⁰ The expected signs of the parameters attached to D_t and S_t will depend on the economic theory reason for their inclusion in the structural model.

⁹¹ When interpreting reduced-form regression coefficients estimated from a model, one needs to remember that these parameters are a function of those from the underlying structural model.

Similarly, the reduced-form quantity equation, $q_t = f(S_t, D_t)$, can be derived from equation (a1) above,

$$q_t = \left(\frac{\gamma_1 \mu_0 - \mu_1 \gamma_0}{\gamma_1 - \mu_1} \right) + \left(\frac{\mu_2 \gamma_1}{\gamma_1 - \mu_1} \right) S_t - \left(\frac{\mu_1 \gamma_2}{\gamma_1 - \mu_1} \right) D_t \quad (a4)$$

This is the same as the reduced form quantity equation:

$$q_t = \beta_3 + \beta_4 S_t + \beta_5 D_t \quad (a5)$$

Assuming that:

$$\left(\frac{\gamma_1 \mu_0 - \mu_1 \gamma_0}{\gamma_1 - \mu_1} \right) = \beta_3 \quad \left(\frac{\mu_2 \gamma_1}{\gamma_1 - \mu_1} \right) = \beta_4 \quad \left(\frac{-\mu_1 \gamma_2}{\gamma_1 - \mu_1} \right) = \beta_5 \quad (\mu_1 - \gamma_1) \neq 0 \quad (a6)$$

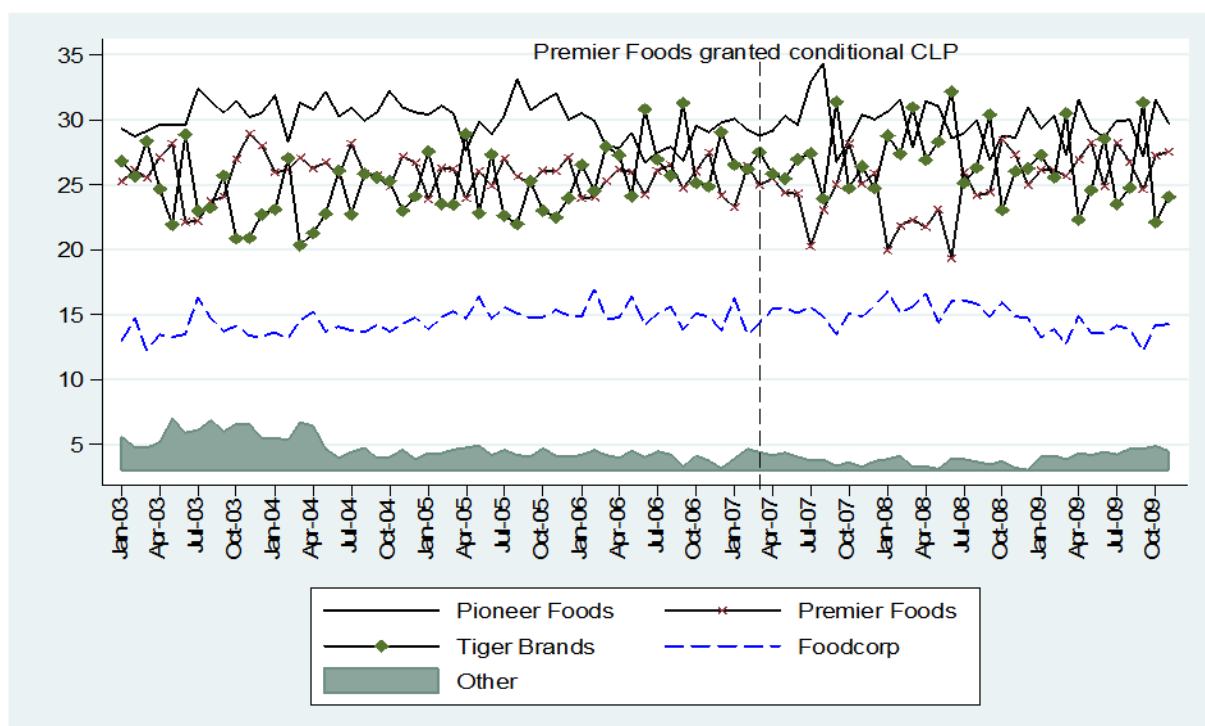
The two reduced-form equations given by (a3) and (a4) show explicitly how the two endogenous variables price and quantity are jointly determined and how changes in the exogenous variables affect the endogenous ones.

II. MARKET SHARE VOLATILITY

In the example of the flour cartel above, the application of the estimation methods focuses primarily on price. It is, however, likewise possible to use these methods to estimate other economic variables such as market shares, profit margins, rate of return on capital or the value of assets. Figure A-1 provides the monthly national market shares over time of total milled wheat flour for all wheat milling members of the NCM for the period 2003-2009. These individual shares have remained relatively stable over time. I would have expected more volatility in share once the cartel was uncovered. Perhaps firms continued with tacit coordination given the market structural characteristics of the flour market.

In fact concerned about this possibility, in 2010, the Commission initiated a complaint against all the flour millers who were also members of the National Chamber of Milling (the industry association) for anticompetitive information exchange. In particular the Commission was concerned that the firms were exchanging disaggregated sales volumes data on a monthly basis, disaggregated per province, per product type, per pack size and per customer channel. Information exchange could facilitate tacit collusion and would increase market transparency by reducing strategic uncertainty about competitors' actions.

Figure A-1: Monthly National Market Shares for All Flour Products (2003-2009)



Source: own calculations

ESSAY TWO

ON MARKET POWER AND CARTEL DETECTION: THE FLOUR CARTEL CASE

1. Introduction

The work of competition authorities centres around the assessment of the degree of competition in an industry. This assessment is usually based on qualitative evidence. In some cases, however, the qualitative evidence is often conflicting and difficult to obtain. But in other cases, notably hard-core cartels, such evidence once obtained often leads to a straightforward prosecution of the cartel. Empirical methods such as those based on conjectural variation models have been suggested as capable of providing possible supportive evidence to the qualitative evidence. It is suggested that these empirical techniques could help to gauge the degree of market power, and to identify the existence of collusive behaviour. For homogenous product industries, these empirical methods consists of estimating a parameter (a conduct or a conjectural variation parameter), whose value indicates the degree of market power that is exercised in the market. A value close to 1 suggests that firms have a greater degree of market power and value close to 0 suggests that firms have a lesser degree of market power.

In the enforcement of competition law, market power is assessed in relation to existing competition, potential competition and the strength of buyers. For several different reasons, competition authorities are expected to identify the source of this market power, which may not be the result of anti-competitive conduct. For example, in abuse of a dominant position cases, the concept dominance depends on market shares and/or market power. According to Section 7 of the South African Competition Act, a firm is dominant in a market if; “(a) it has at least 45 per cent of that market; (b) it has at least 35 per cent, but less than 45 per cent, of that market, unless it can show it does not have market power, or (c) it has less than 35 per cent of the market, but has market power”. The tests applied under the Competition Act, relating to abuse of dominant position cases have two common elements: whether a firm is dominant in a relevant market and, if so, whether it is abusing that dominant position.

In other cases, competition authorities may be expected to determine whether market power in a given industry arises from collusive behaviour. This helps not only in identifying the harmful effects of the collusive behaviour and but could also be useful in detecting the existence of a

cartel. In all cases undertaken by competition authorities, linking market power to firm conduct is at the core of the investigation and the work of competition authorities.

The traditional definition of market power in economics textbooks points out that market power exists whenever firms have the ability to set price above marginal cost. But this definition in which price equals marginal cost only applies to a theoretical setting, where there are no barriers to entry and economic profits are competed away. In reality, market power stems from a number of sources such as fixed costs, product differentiation, cost efficiency, or superior products. To operationalize this definition, the Competition Act defines market power “as the power of a firm or business to control prices, to exclude competition or to behave, to a large extent, independently of its competitors, customers or suppliers”.

In the enforcement of competition law, a conclusion that firms in a particular relevant market have market power or price above marginal cost is not sufficient to determine the existence of anticompetitive behaviour. In many industries market power is widespread and the sources of the market power are multiple. Therefore, it is important to identify market power that results from collusion or anticompetitive behaviour from market power which results from other factors. Interestingly during litigation, in many competition law cases, the debate centres around the existence and source of market power.

I assess whether the flour industry outcomes are consistent with the exercise of market power and whether the firms engaged in coordinated behaviour or competition during some well-defined periods. To this end, section 2 provides a brief description of the flour industry in South Africa. Section 3 introduces the empirical estimation of market power and firm conduct literature. In section 4, I ask the question, do observed prices and quantities in the flour industry reflect switching from collusive to non-collusive behavior and test for this empirically using the monthly time series data from September 2003 to December 2008.⁹² My estimated conduct parameters suggest that the level of market power exercised by the flour millers is quite low in both periods. The perfect collusion hypothesis is rejected by the data. Perfect collusion is coordination on distinct output or price levels equal to the joint profit maximization outcome while partial collusion is often referred to as coordination on distinct output or price levels less than the joint profit maximization outcome.⁹³ Section discusses whether the model can be used to detect cartels. Section 6 concludes.

⁹² Within the framework of a structural model of equilibrium pricing, for a homogenous good market, we specify a simultaneous equation switching regression model in which the parameters of the demand and cost functions are estimated.

⁹³ See for instance Verboven (1997).

2. Industry background and the flour cartel

There are four major firms that operate in the wheat milling industry in South Africa, namely Premier Foods, Tiger Brands, Pioneer Foods and Foodcorp. These four companies control in excess of 90 per cent of the wheat flour market. All four of these firms are vertically integrated in the sense that they mill wheat into flour which is then used to supply both their own bakeries and independent third parties such as the chain stores and smaller bakeries. Although these firms operate across the country, not all of them have mills throughout the country. For example, only Premier Foods, Tiger Brands and Pioneer Foods have mills throughout the country, while Foodcorp has a mill in Gauteng.

Up until the 1990s, the marketing of agricultural products in South Africa, including grain products, was extensively regulated by the state. In this regulated environment, the agricultural co-operatives functioned as regional monopolies and regular meetings were held between wheat millers. These meetings occurred both within the Chamber of Milling and the Wheat Board and as well as outside of these structures. At these meetings, the wheat producers discussed various issues of common interest such as rail deliveries of wheat, wheat quality standards and joint shipment of imported wheat. Thus, a culture of co-operation and discussion was entrenched in the industry over many years.

In 1996, the wheat industry was deregulated. However, despite deregulation, the wheat millers continued to liaise with one another regarding issues of common interest. The National Chamber of Milling also continued as a legitimate forum for sharing information on the industry where issues of common interest were discussed freely and legitimately. In 2007, the Commission uncovered that the wheat millers had also continued, sometimes through the auspices of the Chamber of Milling, as well as through other less formal forums, to engage in collusive behaviour in contravention of section 4 of the Competition Act.

Fighting cartels is one of the most important areas of activity for competition authorities globally. The ability of competition authorities to effectively do so is often hampered by the difficulties pertaining to the gathering of direct evidence. This is not surprising given the nature of cartel activity. Firms engaging in collusive activity rather than competition tend to conduct themselves in secretive and stealthy ways. Firms meet behind closed doors, ensuring that there is no paper trail and at times cloaking their activities in the guise of normal commercial practices thereby seeking to mislead and divert competition agencies.

The cartel members were usually all present at all meetings and those that were not, were brought or kept up to speed on developments and discussions by those present. During various periods when there were no meetings between the representatives of the milling firms, ad hoc contact was maintained by way of telephone calls. The extent of the co-operation between the firms also allowed them to raise complaints amongst themselves in the case of cheating by a firm on the collusive price.

While the cartel meetings took place in various regions, the purpose was the same across all the regions. The firms were concerned with fixing the price of flour and allocating customers. For example, in some provinces, the meetings were better known as “church meetings”. Indeed, the price fixing meetings were held in church halls and were, quite astonishingly, often preceded by a prayer. In other provinces, the firms organised themselves into regional forums and the meetings were not only structured in the sense that the meeting dates were agreed upon in advance, the meetings were chaired by different people.

Regional representatives of the different firms would then report the outcome of the meetings to their national principals. At other times, the national principals themselves attended these meetings. Given that the firms were also involved in maize milling, some of the price fixing meetings would fix both flour and maize meal products. The regional agreements were not discrete agreements with different adherents but were part and parcel of the execution of a national cartel. The firms maintained their conspiracy to fix prices and allocate customers in meetings and at times through telephone contacts between 1999 and 2007.

3. The literature

The New Empirical Industrial Organisation (“NEIO”) literature provides several empirical models to determine the source of market power. Note however, that NEIO models are not so new anymore. In the 1950s and 1960s, the structure-conduct-performance paradigm was the main methodology applied to infer firm conduct. The NEIO literature emerged in the late 1970 relies in part on conjectural variation models and stems from the criticism lodged against the structure-conduct-performance paradigm (see Church and Ware (2000) Chapter 12 for a comprehensive summary of the shortcomings).⁹⁴ The NEIO literature was pioneered by Iwata (1974), Gollop and

⁹⁴ More generally, oligopoly models trace their roots to the seminal works of Cournot (1838) and Bertrand (1883). For a summary see Office of Fair Trading (2011). In Cournot's model, firms simultaneously choose quantities assuming their rivals' quantities are fixed. In Bertrand's model, firms simultaneously choose prices assuming their rivals' prices are fixed. In both cases, whether firms have 'Cournot conjectures' or 'Bertrand conjectures,' firms act as if their rivals'

Roberts (1979), Bresnahan (1981, 1982), and Lau (1982), among others. For a survey see Bresnahan (1989).

The NEIO approach addresses concerns with the structure-conduct-performance paradigm which treats market structure as exogenous. The base hypothesis of structure-conduct-performance paradigm is that more concentrated industries imply less competitive conduct, and hence higher prices. Although the structure-conduct-performance paradigm does not estimate directly firm conduct, it assumes that higher market concentration is associated with more coordination.

The NEIO approach stresses that: (1) one should be careful with the use of accounting cost data; (2) focus on industry-level analysis, and account for institutional idiosyncrasies of the industry; and (3) identify causal relationships rather than correlations. For example, profits and concentration are jointly determined. A correlation between profits and concentration does not necessarily reflect collusive conduct, but rather significant differences in efficiencies among firms. Econometrically, there is an endogeneity problem.

To estimate firm conduct directly, there are two main steps. First, a model of consumer demand is estimated to determine the extent to which consumers are sensitive to price changes (the price-elasticity of demand).⁹⁵ Second, a firm (or industry) supply relation is also estimated in order to recover a value for the conduct parameter. To recover the conduct parameter, the estimate of the price elasticity of aggregate demand is used. The value taken by the estimated conduct parameter tells us about firm behaviour, for example, (1) when the conduct parameter takes the value of 0, the firms are perfectly competing and price equals marginal cost; (2) when the conduct parameter takes the value of 1, the firm is a monopolist or firms are perfectly colluding; and (3) when the conduct parameter is equal to the ratio of number of firms in the market, there is Cournot competition.

choices are fixed when they make their own choices. Bowley (1924) was the first to introduce the notion of a 'reaction function' and the idea that firms might anticipate their rivals' reactions when making their choices (Office of Fair Trading (2011)). His model and those that trace their roots from it have become known as conjectural-variations models, where the term 'conjectural variations' was coined by Frisch (1933) to describe the slopes of the conjectured reaction functions.

⁹⁵ The intuition is simply that consumer behaviour governs the ability of firms to raise price above marginal cost. If consumers are very price sensitive, (for example a large number of consumers stop purchasing the product in response to a price increase), firms in the industry are unable to exercise market power. As a result, the unit price-cost margin is small.

4. Estimating market power and firm conduct in the wheat flour industry

My goal is to estimate market power and show how market power changed after the uncovering of the cartel. I do this by isolating the cartel and non-cartel influences on price and quantity. This allows us to understand the interaction of buyers and sellers in the wheat flour industry through explicitly constructing behavioural supply and demand relations in the context of a structural model.⁹⁶ I use a switching model to identify collusive conduct whenever observed data contains a collusive and non-collusive of conduct across time periods, as in the Porter (1983) model. In this tradition, the model below allows the firms' conduct to vary between periods of collusion and of competition (after the cartel). In other applications, firms supply the same product, but they behave differently depending on the geographic market, one such example is Salvo (2010) who set to test whether coastal cement markets in Brazil are constrained by the threat of imports, whilst inland cement markets are not.

A. DEMAND

Following Porter (1983), assume a static, homogeneous product oligopoly model where the number of firms N is exogenous. All firms know the functional form of market demand and each other's costs. The major cost component of milling flour is wheat which is sourced from SAFEX. Wheat flour is a homogenous product. Assume there is a constant elasticity industry demand curve. A constant elasticity demand function considerably simplifies subsequent calculations and estimation. Now suppose market price in period t is denoted by p_t and the total quantity demanded, Q_t is assumed to be a log-linear function of price,

$$\ln Q_t = \alpha_0 + \alpha_1 \ln p_t + \alpha_2 \ln G_t + \mu_{1t}, \quad (1)$$

The price elasticity of demand is given by α_1 , is presumed to be negative. Similarly α_2 is presumed to be positive. This is because G_t is a vector of exogenous demand shifters. The demand shifters include prices of substitutes, for example, breakfast oats. Prices of substitutes

⁹⁶ The main attraction this model is that it results in a two-equation linear system that explain equilibrium industry price and quantity data. The two reduced-form equations show explicitly how the two endogenous variables (p_t and Q_t) are jointly determined, and how changes in the exogenous variables affect the endogenous ones. Fortunately, we have industry data on prices and quantities. In competition law practice and some academic writings, however, it is easier to obtain pricing data than quantity data, and therefore common to see only the reduced-form price equation. That is, data on prices and the independent variables are used to estimate values for the reduced-form regression parameters. Then, by using the actual values of the independent variables and the reduced-form regression coefficients, predicted values for prices, as well as but-for prices, can be generated for the calculation of overcharges.

have a positive effect on demand. μ_{1t} is the error term ($\mu_{1t} \sim N(0, \sigma^2)$). The demand error term, accounts for demand factors observable to firms but not included in the model.

B. SUPPLY

Assume that each firm has fixed costs of F_i and a constant elasticity variable cost function. The cost of producing output q_{it} for firm i in period t is given by,

$$C_i(q_{it}) = a_i q_{it}^\delta, \quad \text{for } i = 1 \dots N, \quad (2)$$

where δ is the constant elasticity of variable costs with respect to output and is equal to one if there is an equilibrium. The firm specific shift parameter is a_i . The fixed costs are assumed to be small enough that firms have positive discounted expected profits in equilibrium. The firm-level cost function allows for an industry supply or output curve for a range of models of competition. Now for optimisation assume that each period (for example, one month), firms maximize their per-month profits. Additionally, assume each firm forms a conjecture about how other firms will respond during that month, θ_{it} . The wheat flour of the firms is of approximately the same quality, all firms charge equal prices in the equilibrium. From these behavioural assumptions, the actions of firms can be summarised by

$$p_t \left(1 + \frac{\theta_{it}}{\alpha_1}\right) = MC_i(q_{it}) \quad \text{for } i = 1 \dots N, \quad (3)$$

Marginal revenue equals marginal cost, first-order conditions for profit maximization by each firm. Here MC_i is the marginal cost function of firm i . In the Bertrand equilibrium, if firms choose price non cooperatively in each period, they price at marginal cost. This means that $\theta_{it} = 0$ for all i and t . If instead they maximise joint profits, that $\theta_{it} = 1$ for all i and t . If instead firms produce at Cournot output levels, $\theta_{it} = s_{it} = q_{it}/Q_t$, the market share of firm i in period t .

While, the economic model applies to individual firm decisions and noting that the wheat flour cartel was not characterised by new entry during the cartel period, I do not estimate firm-level models. For estimation purposes, aggregate data is used. As is common when only industry-level price and quantity data are available, the individual supply equations are weighted by market shares in time t , s_{it} and added up.⁹⁷ Then I get an industry supply relationship,

⁹⁷ This approach, while reducing the number of estimating equations, is not without limitations. In aggregating the first-order conditions, one cannot estimate separate conjectural and cost parameters for each firm and time period. To reduce the dimensionality of the parameters in the industry supply function, Porter (1983) assumes that the firm-level values of θ_{it} times the associated market shares are the same constant. This assumption has the important computational

$$p_t \left(1 + \frac{\theta_{it}}{\alpha_1}\right) = \sum_i s_{it} MC_i(q_{it}) \quad \text{where } \theta_t = \sum_i s_{it} \theta_{it}. \quad (4)$$

Given these functional forms for the market demand and cost function, the market share of firm i in period t will be $s_{it} = \frac{a_i^{1/(1-\delta)}}{\sum_i a_i^{1/(1-\delta)}} \equiv s_i$ in each of the above cases above.

The market share of each firm will be constant over time and invariant across changes in industry conduct. The higher the value of the firm specific variable cost shift parameter, a_i , the lower is the market share of firm i .

The supply relationship can now be written as,

$$p_t \left(1 + \frac{\theta_t}{\alpha_1}\right) = D Q_t^{\delta-1} \quad \text{where } D = \delta \left(\sum_i a_i^{1/(1-\delta)}\right)^{1-\delta} \quad (5)$$

D depends on only on the parameters of the cost functions of the firms. Taking the natural log of the supply relationship yields the aggregate supply function, apart from the addition of an error term,

$$\ln p_t = (\delta - 1) \ln Q_t + \ln D - \ln \left(1 + \frac{\theta_t}{\alpha_1}\right) \quad (6)$$

For Bertrand, Cournot or perfectly collusive firms $\theta = 0$ or H or 1 , respectively. H is the Herfindal index and is invariant across time, as long as the number of firms remains unchanged. Suppose I_t is a dummy variable which equals to 1 when the industry is in a collusive state (in relation to the wheat flour cartel, this is the period up until March 2007 when Premier was granted conditional immunity from prosecution) and equals 0 when the industry is in a non-cooperative state. Because I observe alternative periods of perfect competition and collusion, based on the dummy variable, I_t , I can specify the time varying conduct parameter, $\theta_t = \theta_0 + \theta_1 I_t$. The parameter θ_0 is still not identified. Porter (1983) essentially assumes it is zero. It is also reasonable to assume that in the flour industry after the uncovering of the cartel, firms compete perfectly. The parameter θ_1 is identified. Then the supply relationship is given by,

$$\log p_t = \beta_0 + \beta_1 \log Q_t + \beta_2 S_t + \beta_3 I_t + \mu_{2t} \quad (7)$$

advantage of reducing the number of conjectural and cost parameters to two. It makes it easy to calculate equilibrium prices and quantities in perfectly competitive and monopoly (collusive) markets. However, this simplifying assumption has some disadvantages. For example, it is unclear why conjectural parameters should vary inversely with market shares.

If during the collusive period firms maximise joint profits then $\beta_3 = \log(1 + \frac{1}{\alpha_1})$. Assuming that at the period when the cartel breaks up, conduct is Bertrand, that is, firms compete perfectly. Then $\beta_0 = \log D$ and $\beta_1 = \delta - 1$. Since δ is assumed to be greater than 1, β_1 should be positive.

C. IV ESTIMATION

To estimate the demand and supply functions, I do not use ordinary least squares (OLS) or the basic econometric approach because both functions are likely to contain an endogenous regressor. OLS estimations could introduce two econometric problems. First, OLS estimators of the coefficients on price are inconsistent since price is endogenously determined in the supply-and-demand system (Goldberger, 1991). Second, if the error terms in the supply-and-demand equations are correlated, then the OLS estimates lack efficiency (Lin, 2005).

Put differently, using OLS ignores the interdependence of flour price and flour demand. An increase in the demand leads to an increase in the willingness to pay and Millers are able to charge a higher price per unit. On the other hand, a decrease in price, for example, due to an improved milling technology, leads to an increase in demand. From an econometric perspective, applying OLS lacks both identification and efficiency. This can therefore lead possibly to erroneous estimates. To address the identification problem, I use the instrumental variable (IV) estimator and implement two stage least squares (2SLS) using the `-ivreg2-` routine in Stata v12.⁹⁸

IV estimation basically involves replacing the endogenous variable in the equation of interest with its predicted value from an OLS regression which regresses the endogenous variable on a set of instrumental variables. These instruments should be good predictors of the endogenous variable (i.e., they should be relevant and strong predictors) but should be appropriately excluded from the equation of interest (i.e., they should be valid instruments).⁹⁹

Note that the relevance of an instrumental variable refers to its ability to predict the endogenous variable of concern, whereas validity refers to the requirement that instruments should be uncorrelated with the error term in the equation of interest. If the instrumental variable is relevant

⁹⁸ See Baum, C.F., M.E. Schaffer, and S. Stillman, `ivreg2`: Stata module for extended instrumental variables/2SLS, GMM and AC/HAC, LIML and k-class regression. See <http://ideas.repec.org/c/boc/bocode/s425401.html>.

⁹⁹ A valid instrument should meet three requirements; (1) the instrument must be correlated with the endogenous variable, conditional to the other covariates; (2) the instrument cannot be correlated with the error terms in the explanatory equation and (3) exclusion should also be applied when instrumental variables are selected to differentiate the supply and the demand equation. An exogenous supply shifter does not affect demand except through its effect on price and can be used as a valid instrument for price in the demand equation. Similarly, an exogenous demand shifter does not affect supply except through its effect on price and can be used as a valid instrument for price in the supply equation.

and valid, 2SLS will produce consistent estimates of the parameters of the reduced form models. I subject the instrumental variables to tests for validity using the Sargan-Hansen test of overidentifying restrictions. The joint null hypothesis is that the instruments are valid instruments (i.e., they are uncorrelated with the error term) and that the excluded instruments are correctly excluded from the estimated equation. A rejection of the null hypothesis casts doubt on the validity of the instruments.

To ensure the robustness of my estimates to arbitrary heteroskedasticity, I estimate my models with Stata's `-robust-` option. The Cragg-Donald statistics are not valid in the presence of heteroskedasticity. I therefore report the Kleibergen-Paap LM statistic (testing instrument relevance) and the Kleibergen-Paap F statistic (testing for weak instruments) which are valid in the presence of heteroskedasticity. In both cases, a significant result suggests that the 2SLS model is identified (i.e. the relationship between the instrumental variable and the instruments is sufficiently strong to justify inference from the results). An insignificant test statistic indicates that the model is underidentified or too weakly identified (due to the weak relationship between the instrumental variable and the instruments) to justify inference from the model.

I use the Ramsey reset test, adapted for instrumental variable estimation, to provide test of model specification. The test is more properly thought of as test of a linearity assumption in the mean function or a test of functional form restrictions and omitted variables and can be useful as a general check of model specification. In addition, I check that the presumed endogenous variable is in fact endogenous.

D. DATA

Before discussing results, note that the dataset contains information on monthly sales volumes, flour prices, and prices of demand and cost variables from September 2003 to December 2008. Table 2-1 presents some of the descriptive statistics and variable description.

Table 2-1: Descriptive statistics

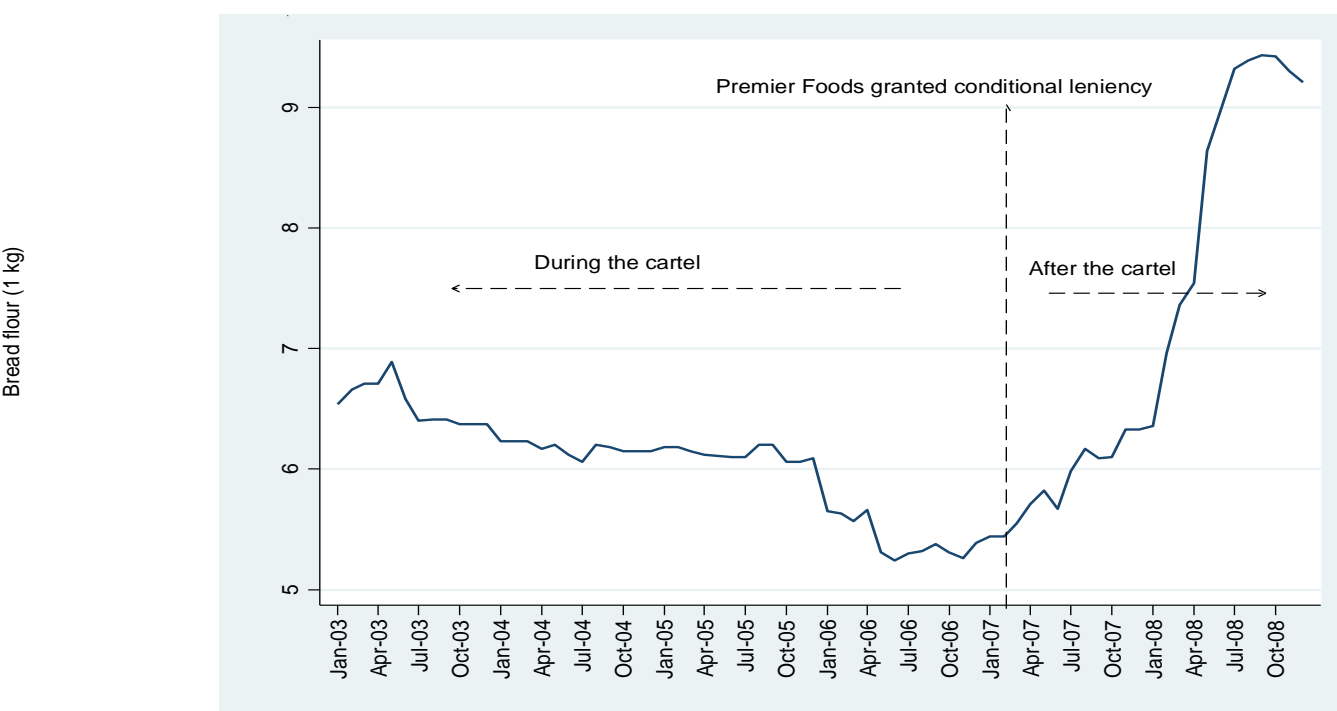
Variable	Obs	Mean	Std. Dev.	Description
Total quantity	64	165844.0	12791.2	Total quantity of cake flour (tonnes)
SAFEX	64	2098.6	856.4	Average monthly SAFEX Randfontein wheat price per tonne (Rand)
Price flour	64	6898.7	1260.6	Average monthly price of bread flour per tonne (Rand)
Rice	64	8.2	2.5	Price of rice per kg (CPI, Rand)
Other costs	64	494.4	53.3	Other costs per tonne of flour (Rand)
Breakfast oats	64	9.9	1.2	Price of breakfast oats per 500g (CPI, Rand)
Maize meal price	64	4.2	0.8	Price of maize meal per kg (CPI, Rand)
DUMMY	64	0.7	0.5	1 if in cartel period and 0 otherwise

The dataset is constructed using a combination of both public and private data. The private data is from the National Chamber of Milling (“NCM”) and the firms involved in the cartel themselves. The private dataset includes sales volumes. I include in the dataset monthly consumer price index data gathered from Statistics South Africa (“Stats SA”). This data captures monthly food prices and is provided by the South African Grain Information Service (“SAGIS”). This data is in the public domain. It contains nominal prices of flour and its substitutes such as maize meal, cereal, oats and rice. Figure 2-1 shows evolution of bread flour prices during and after the cartel.

The wheat cost for is calculated using the average monthly SAFEX Randfontein wheat price per tonne (i.e. monthly average using daily SAFEX prices, lagged by 3 months to take into account of mills buying wheat on forward contracts) plus the SAFEX transport differential which is adjusted annually. Other costs are obtained from the firms’ annual submission to the NCM’s costing survey data. These costs are averaged across the regions for all of the firms and include packaging, distribution, production and marketing costs per tonne of milled wheat. The quantity data is obtained from the monthly destination of flour sales in tonnes per region. The cereals price index is compiled using the grains and rice price indices weighted by their average trade share for

2002-2004. The cereals price index is provided by the United Nations Food and Agriculture Organization (“FOA”).¹⁰⁰

Figure 2-1: Bread flour prices (1kg) Nominal CPI, Rands



Source: Statistics South Africa, SAFEX. Food Price for the Period, South African Grain Information Service and own calculations

E. RESULTS

The estimated results are shown in Table 2.2. Columns 1 and 2 show the estimated results for the log-linear specification (where logarithms are taken of both dependent and independent variables). In the demand equation, the price elasticity is negative and significant but less than 1 in absolute value. The demand curve is inelastic. This is consistent with the fact that wheat flour is used in a wide range of products for which substitutes cannot be readily found. As expected, increases in the price of oats and the cereal price index lead to greater flour demand. A 1 per cent rise in the price of oats makes for a 0.352 per cent increment in flour demand. This does not seem out of line with expectations. The coefficients for price and prices of oats are significant and positive. The supply equation shows that price was significantly higher during the cartel. Price is

¹⁰⁰ Food and Agriculture Organisation (FAO) (2013). FAOSTAT-Agriculture database. Food and Agriculture Organization. [online] Available at: <<http://www.fao.org>>

an increasing function of quantity demand as expected. However, the coefficient for quantity is not significant.

Table 2-2: Regression analysis (IV estimation)

VARIABLES	log-linear model		linear model	
	(1) Quantity	(2) Price	(3) Quantity	(4) Price
Price	-0.132** (0.0667)		-2.986** (1.381)	
Maize meal	-0.236*** (0.0645)		-8.828*** (2.712)	
Breakfast oats	0.347** (0.157)		6,325** (2,582)	
Cereal price index	0.122*** (0.0289)		104.8*** (26.13)	
Constant	13.75*** (0.497)	30.54* (18.20)	145,616*** (12,066)	24,523* (14,389)
Quantity		2.633 (1.904)		0.198 (0.143)
SAFEX price		0.490*** (0.0682)		1.494*** (0.214)
other costs		0.979 (0.836)		27.28 (21.92)
Dummy cartel		0.216** (0.102)		2,235* (1,158)
Observations	64	64	64	64
R-squared	0.561	0.636	0.502	0.463
Underidentification test (Kleibergen-Paap rk LM statistic):	17.369	9.178	18.906	8.483
Chi-sq(3) P-val =	0.001	0.083	0.000	0.101
Weak identification test (Cragg-Donald Wald F statistic):	12.069	7.297	16.506	6.514
(Kleibergen-Paap rk Wald F statistic):	13.479	8.465	17.36	7.33
Hansen J statistic (overidentification test of all instruments):	0.0018	0.0319	0.518	1.971
Chi-sq(2) P-val =	0.9044	0.0863	0.444	0.1785
-endog- option:				
Endogeneity test of endogenous regressors:	15.463	12.795	25.648	12.897
Chi-sq(1) P-val =	0.0004	0.0002	0.0001	0.0002
Ramsey/Pesaran-Taylor RESET test				
Test statistic:	0.002	0.063	0.097	3.075
P-value	0.962	0.797	0.881	0.781

Notes: (i) Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; (ii) for the endogeneity test the null is that the specified endogenous regressors can actually be treated as exogenous; (iii) the instrument validity test is based on the Hansen-Sargan test. The joint null hypothesis is that the instruments are valid instruments, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. (iv) A statistical test of instrument relevance is provided by the Kleibergen-Paap LM test. The null hypothesis is that the instruments are not relevant. (v) Weak identification arises when the excluded instruments are correlated with the endogenous regressor, but only weakly. The Kleibergen-Paap Wald F statistic provides a formal test of weak identification. The null hypothesis is that the instruments are weak.

Columns 3 and 4 show the estimated results corresponding to the linear specification (where the data observations for both dependent and independent variables are left as levels).¹⁰¹ The diagnostic statistics reveal that, for both IV models, the endogenous variable is endogenous and the instruments are valid. They also suggest that the instruments are relevant and there is no evidence that the instruments are weak. The Pesaran-Taylor test suggests that there is no evidence of model misspecification.

If I assume $\beta_3 = \log(1 + \frac{\theta}{\alpha_1})$ for some constant θ , then the value of θ implied by the estimates of β_3 and α_1 is 0.031. What is important to note is that during the cartel prices were above those implied by the perfectly competitive price setting and were less than those implied by static joint profit maximizing. Note as well, that there is a slight drop in market power after the end of the cartel and θ is 0.028. My estimated conduct parameters suggest that the level of market power exercised by the wheat flour millers is quite low in both periods. In fact, it is closer to perfect competition $\theta = 0$ than the monopoly outcome $\theta = 1$. The perfect collusion hypothesis is rejected by the data. But this highlights one important shortcoming of this approach. To be clear, when the estimated conduct parameter diverges from those implied the models of competition then I cannot define precisely the firm behaviour.

There are two conditions to measure market power accurately. First, the functional form assumptions on demand and marginal cost must be correct, and second, the observed market outcomes must be generated by a conjectural variation model. If these conditions are not met, the risks of misspecification are high and the estimated market power (or conduct) parameter will become biased.

I report estimates of the conduct parameter under two different functional form assumptions so as to assess the sensitivity of the conduct parameter estimate. A standard problem in most empirical studies is the selection of a functional form for the demand and marginal cost that is a poor

¹⁰¹ Assume a linear inverse demand function as below, where Q_t is demand in period t, P_t is price in period t and X_t is an exogenous demand shifter.

$$Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 X_t + \epsilon$$

The supply function can be written as:

$$P_t = \beta_0 + (\beta_1 - \frac{\theta}{\alpha_1})Q_t + \beta_2 W_t + \mu$$

where W_t is the exogenous cost shifter and Q_t is the quantity in period t. We solve the identification problem by assuming $\theta_t = \{\theta^c, \theta^n\}$ takes two values, θ^c indicates the value under a collusion regime and θ^n indicates the value under a non cooperative regime.

approximation of the data. The problem is that these assumptions cannot be directly tested. This leads to misspecification issues.¹⁰²

Another source of misspecification arises when the underlying economic model that generates the price and quantity data observed is poorly approximated by a conjectural variation model, then the empirical conjectural variation models may fail to estimate accurately market power. For example, the equilibrium outcome of some repeated oligopoly games cannot be reproduced by a conjectural variation model. In these cases, Corts (1999) critique applies.

Corts (1999) finds that empirical conjectural variation models can yield inconsistent estimates of the conduct parameter if firms are engaged in efficient collusion (that is, above Cournot, below monopoly). For example, suppose that firms are colluding on a price higher than the Cournot price but lower than the joint monopoly price. Corts shows that the traditionally estimated conduct parameter typically will underestimate market power. This is because the traditional empirical industrial organisation approach does not consider the potentially binding incentive compatibility constraint (ICC) associated with the sustainability of collusion.

Puller (2009) offers a solution to the Corts (1999)'s critique. I do not use, however, Puller (2009)'s correction for two reasons: (1) it requires firm-level quantity data, which I do not have; and (2) Puller (2009)'s correction is robust to efficient tacit collusion, but may not be robust to other forms of dynamic pricing. The degree of market power in wheat flour market is quite low implying that collusion may have been quite inefficient. So the Cort's critique may not even apply to my situation.

To estimate market power, some studies compare the estimate of the conduct parameter with direct estimate of the elasticity-adjusted Lerner index. However, the difficulties of getting access to data that accurately describes marginal cost mean that a very few studies can actually implement this comparative assessment. There is a growing literature examining the accuracy of empirical conjectural variation models.

Starting with Genesove and Mullin (1998) who tested static oligopoly models using detailed historical data on the US sugar industry in the late 19th and early 20th century. During this time, the American Sugar Refining Company (also known as the Sugar Trust) attempted to dominate the industry, whilst fighting several entry attempts. Genesove and Mullin estimate the industry level conduct parameter during this period.

¹⁰² To illustrate arbitrarily, suppose the industry level conduct parameter estimate is 0.5 whereas the Cournot is 0.25 (in a four-firm market), the difference may simply be due to misspecification.

Their work was motivated by questions about the empirical conjectural variation model's approach to estimation. The empirical conjectural variation model's estimation relies on the first order condition for a firm relating price, conduct, output, inverse demand. The first order condition is used to estimate the conduct parameter directly or to estimate cost for a given value of the conduct parameter. Questions about the approach have centred on the robustness of estimates across functional forms and, more importantly, on the Corts (1999) critique. Genesove and Mullin (1998) illustrate that empirical conjectural variation models of estimating market power understate market power.

Wolfram (1999) uses detailed marginal cost data from the UK electricity industry to compare the industry level elasticity-adjusted mark-ups and finds that market power is very low (that is, the calibrated conduct parameter is 0.05, equivalent to a symmetric 20 firm Nash-Cournot model). Then and in line with the approach taken by Genesove and Mullin (1998), Wolfram uses rotations of demand to estimate the industry conduct parameter. The results reveal an industry conduct parameter very close to 0.

Clay and Troesken (2003) follow a similar approach as that used by Genesove and Mullin, in particular they adopt similar demand and cost function, to the US Whiskey Trust in the late nineteenth century. Notwithstanding the fact that the Trust was a hard-core cartel, their results suggest that it did not exercise much market power. They found a relatively low level of market power. Like Genesove and Mullin, Clay and Troesken find that the NEIO methodology appears to perform reasonably well for low levels of market power. They find that when conduct was allowed to have two regimes, normal and more collusive, which were identified based on historical evidence, estimates improved further. For the linear model, estimates of conduct were 0.07-0.09 for the normal, 0.15-0.18 for the more collusive regime depending on the informational structure. This compares well to direct estimates of 0.08 for the normal regime and 0.18 for the more collusive regime

Kim and Knittel (2006) also compare direct estimates of the adjusted-Lerner index that they construct using actual data on marginal cost with the estimated conduct parameter. To recover the elasticity of demand, they estimate a demand model for strategic firms, that is, firms that possess market power. They leave aside non-strategic firms that are price-takers and only bid their marginal cost curves. To test the robustness of the results, they assume that the demand curve takes different functional forms. Their analysis shows that the estimated conduct parameter tends to overstate market power. For example, in the linear demand case, the direct estimate of market power is 0.070 whilst the conduct parameter estimate from the estimated model is 0.123. The comparison becomes even less favourable for the linear-log and log-log models. For these models

the conduct parameter estimates are 0.188 and 0.229 respectively. Salvo's (2010) study finds that the empirical conjectural variation model of estimating market power understates market in the Brazilian Cement industry.

The available evidence is mixed. It does not appear that the reliability of the empirical conjectural variation model approach is a function of the issues that are being investigated. For example, Genesove and Mullin (1998) and Clay and Troesken (2003) both examine the CPM's ability to recover estimates of market power in hard-core cartels, yet they find bias in opposing directions. Similarly, Kim and Knittel (2006) and Salvo (2010) estimate the degree of market power exerted in two homogenous product industries and also they find different directions for the bias.

5. Detecting cartels

In many competition investigations, the set of evidence gathered by competition authorities is not always clear-cut. Discriminating between collusive and non-collusive conduct is a challenge.¹⁰³ The empirical conjectural variation model approach may be helpful when such situation arises.

But can it also be used to detect cartels? The presence of high price-cost margins may be an obvious first indication of a cartel. Harrington (2008) cautions on the pitfall of this measure as a screen for collusion because price-cost margins may be high for two reasons, that is, a high conduct parameter or a low price elasticity of demand. Hence, from observing high price-cost margins one may falsely conclude there is a cartel, whereas in practice the elasticity of demand in the industry is very low. A high price-cost margin whenever properly measured only provides evidence of market power and does not imply collusion.¹⁰⁴

So a more refined approach would be to use evidence on a high conduct parameter as an indication of cartel behaviour. Essentially this method compares the collusive and competitive models in order to determine which better fits the data. There is evidence of collusion if a collusive model better fits the data and the conduct parameter is high.¹⁰⁵ While appealing at first, there are major problems to this approach which explain why it is not commonly as a tool for detecting cartels. First, there are empirical problems with estimating conduct associated with the robustness to functional form and specification errors. Second, and more importantly, there is also

¹⁰³ For competition authorities, the objective of detecting a cartel is not to identify industries with high price-cost margins but rather to uncover prosecutable cases of collusion.

¹⁰⁴ Other reasons for a high price-cost margin are greatly differentiated products, production technologies protected by patents and trade secrets, and high search costs for consumers; and one suspects these are much more ubiquitous than collusion.

¹⁰⁵ Applications include Porter (1983) and Ellison (1994).

the question on the appropriate benchmark. How high should the conduct parameter be to speak of a cartel?

To illustrate, in the flour industry, firms admitted their guilt and settled the case before adjudication motivated by the testimonies of the other conspirators. However, available evidence suggests that demand is inelastic, so that the cartel was clearly not perfect in implementing the monopoly outcome. At the same time, the conduct parameter was not estimated to be very high, yet it may have been sufficiently high to raise prices drastically. Put differently, perfect collusion is often unlikely, but partial collusion may be sufficient to raise prices drastically and make cartels successful. So the question then is, how severe should partial collusion be before it should be used as evidence of an (illegal) cartel? For these reasons, it is unlikely that an estimate of the conduct parameter can be very useful in competition cases as evidence of the existence of cartels.

Perhaps a simpler approach which focuses on looking at prices and whether there have been structural breaks is more useful. The idea is to simply estimate a reduced form price regression as a function of exogenous demand and cost shifters and include a test for a structural break. This test essentially asks whether price has increased or decreased at a certain time period for reasons other than demand or cost variables.

A related application is by Abrantes-Metz, Froeb, Geweke and Taylor (2005). They use the time at which companies become aware of the competition investigation as the structural break. They test whether the variance in prices changes, and find a significant decrease in the price variance. One should generally be cautious because the event (such as trade association, new entry) may lead to a structural break for other reasons than cartel behaviour. For this reason, it is important to also show that the structural break is consistent with cartel behaviour. If there is no prior information on breaks, one may attempt to visually identify a break from a price series graph, e.g. see when price starts trending upwards or down-wards. There are also statistical methods for identifying structural breaks without prior information.

Alternatively, I can test for differences between competitive and cartel firms. The illustration of this approach is provided in Porter and Zona (1993). They look at 116 auctions for highway construction contracts during 1979-1985. The procurement auctions are organized as first-price sealed bid. They have prior information on which firms were convicted for rigging bids. Bid rigging may take various forms: agreeing on bids in advance, on who will submit the lowest bid, rotating lowest bid, agreeing not to participate, etc.

They estimate the bid function separately for competitive firms and for cartel firms. They find that the coefficients are significant for competitive firms (bids are initially decreasing and then

increasing in capacity and utilization. For cartel firms, the coefficients are insignificant or have opposite signs. A Chow test rejects the hypothesis that coefficients are equal. Porter and Zona also look at the ranking of bids. They find that the probability of being the lowest bidder or highest bidder does not differ significantly for competitive firms, but they do differ significantly for cartel firms. This is consistent with cartel story: winning bids (the lowest bids) are driven by cost determinants and expected surplus. In contrast, phantom bids (non-winning) should only be higher than the winning bid, but should not otherwise relate to cost factors.

Porter and Zona (1999) use a similar approach for procurement auctions for school milk. A market is a school district where each district awards an annual contract for the supply of school milk. They test whether the bids of suspected firms respond the same way as the bids of competitive (unsuspected) firms. They estimate a bidding function for alleged cartel members and compare this with bidding functions of competitive firms. In addition, they also estimate a probit equation for the probability to participate in an auction. In summary, in these studies there is prior information on who is a possible cartel firm. In the first step one then tests whether there are significant differences in bidding behaviour between both groups of firms, and in a second step one shows that the differences can be explained by a cartel story.

6. Conclusion

I have applied a 'switching model' approach suggested by Porter (1983) to the flour industry in South Africa. My goal was to demonstrate how a switching model could help assess market power. I identified two periods in the data, (1) the collusive conduct period and (2) the non collusive conduct period. To implement the model, I assumed that after the cartel ended, firms adopt a specific conduct (for example, perfect competition), which then allows us to recover the level of market power under collusion.

Note that whenever I use this approach, I am likely to obtain a non-zero value for the conduct parameter. This would suggest that firms exercise some market power. Market power defined to mean that firms set price above marginal cost. This observation is too general and does not give us insights into the conduct, given that, even if the conduct parameter value is above zero in a given market in which several firms supply a product, this does not imply that these firms do not compete. Market power is not always the result of collusive conduct. There exist alternative sources of market power. For example, firms can achieve market power by supplying differentiated products or by having production processes requiring large upfront fixed costs.

My estimated conduct parameters suggest that the level of market power exercised by the wheat flour millers was quite low in both periods. But it does not correspond to the values implied by the models of competition. At first glance, this is surprising because I have hard core evidence of cartel during the collusive period. But, one could suggest simpler explanations for this observation. For example, the desire to have a 'quiet life' on the part of managers leads to managerial slack. Managerial slack may provide a motive of managers forming a cartel that may not show up in the form of profitability but x-inefficiencies.

However, several important lessons are demonstrated by the findings. First, when the estimated conduct parameter diverges from those implied the models of competition, I cannot define precisely the firm behaviour. Second, given that the identification of the conduct parameter relies on functional form assumptions, it is important to test the robustness of the results to different functional form assumptions. Third, in order to use the model, I assumed that flour is homogenous. In other industries, where products are differentiated, the model would not be applicable. Further, as suggested by the Corts critique, when firms' behaviour cannot be replicated by a conjectural variation model, the results are unreliable.

In light of the above, a pessimist might very well argue that the empirical conjectural variation model approach does a poor job of estimating market power and detecting cartels. While admittedly, this may be the case, it is not unique to the empirical conjectural variation models. The weaknesses of the models highlights a cautionary note for policy makers. This means caution should be exercised when relying on empirical techniques to makes inferences about industry performance. Therefore, one needs to point out at the outset that the empirical conjectural variation models are not perfect. More precisely, there are based on static models of competition, while collusive conduct is best explained by taking into account repeated firm interactions. However, knowing that a model has shortcomings is not a reason to ignore it when insights from the model could support the qualitative evidence. In any case, for policy makers' best practice suggests that whenever any empirical model is used in competition policy, the policy maker must assess the empirical results in light of the limitations and perform sensitivity analysis to assess the robustness of the results. Furthermore, the policy maker must contrast the given results with the qualitative evidence.

B. Appendix

I. MARKET POWER

A common measure of market power is the above Lerner index. The problem is that marginal costs are unobserved. Suppose however that we know how to describe competition in the market. Consider, the following example of a perfect cartel. Assume that demand is given by $Q = Q(p)$, with $Q' < 0$ and cost is given by $C(Q)$ and further the equilibrium is given by profit-maximizing price [or quantity].

The profits are given by $\pi = p(Q) - C(Q(p))$ and the optimal price stratifies the following first order conditions:

$$Q(p) + pQ'(p) - C'(Q(p))Q'(p) = 0 \quad \text{a1}$$

$$Q(p) + (p - C'(Q(p)))Q'(p) = 0 \quad \text{a2}$$

This describes the trade-off between increasing margin and reducing sales following a price increase. We can therefore measure monopoly power by the Lerner index:

$$L \equiv \frac{p - C'}{p} = \frac{1}{\eta} \quad \text{a3}$$

With homogenous products, Bertrand competition gives rise to the Bertrand paradox, that is, in a static model with only two price-setting firms prices equal marginal cost, so there is no market power. In a Cournot industry with homogeneous products the industry-level market power is

$$L \equiv \frac{p - C'}{p} = \frac{H}{\eta} \quad \text{a4}$$

The Lerner index can take any value between 0 and 1. Under perfect competition, the Lerner index is 0. Firms are assumed to exercise market power when the Lerner index takes any positive value. However, the Lerner index does not indicate of firm conduct. For example, in some industries the Lerner index near 1, because marginal costs are close to 0, yet firms may be actively competing. A high Lerner index does not necessarily mean that there is collusive conduct. They can be there are multiple sources of market power.

The price-elasticity of demand tells us by how much demand will fall when price goes up. This is because consumer behaviour governs the ability of firms to raise price above marginal cost. If consumers are very price sensitive, this limits the firms' ability to exercise market power and hence, the price-cost margin is small. Alternatively, when the price-elasticity is low (inelastic

demand), firms have high profit margins. Consider two simple specifications to estimate the price elasticity of demand. First, the linear demand function, $Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 X_t + \epsilon$, where X are exogenous demand shifters (e.g. income); ϵ is the error term. The price-elasticity of demand is given by $\eta = -\alpha_1 (\frac{P}{Q})$. Whereas, with constant elasticity demand function, $\ln Q_t = \alpha_0 + \alpha_1 \ln P_t + \alpha_2 \ln X_t + \epsilon$. The price-elasticity of demand is given by $\eta = -\alpha_1$

In the NEIO approach, the equilibrium condition is used to measure market power without observing costs. Three pieces of information are necessary to estimate market power without relying on accounting data: (1) knowledge of the conduct in this particular industry; (2) a consistent estimate of the price elasticity of industry demand; and (3) Information on the market shares.

II. IDENTIFYING CONDUCT

Can conduct be identified (jointly with cost and demand parameters) from equilibrium price and quantity data from different time periods? Following Bresnahan (1982), assume a linear inverse demand function as below, where Q_t is demand in period t , P_t is price in period t and X_t is an exogenous demand shifter.

$$Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 X_t + \epsilon \quad \text{a5}$$

The linear marginal cost function is:

$$MC_t = \beta_0 + \beta_1 Q_t + \beta_2 W_t + \mu \quad \text{a6}$$

where W_t is the exogenous cost shifter and Q_t is the quantity in period t .

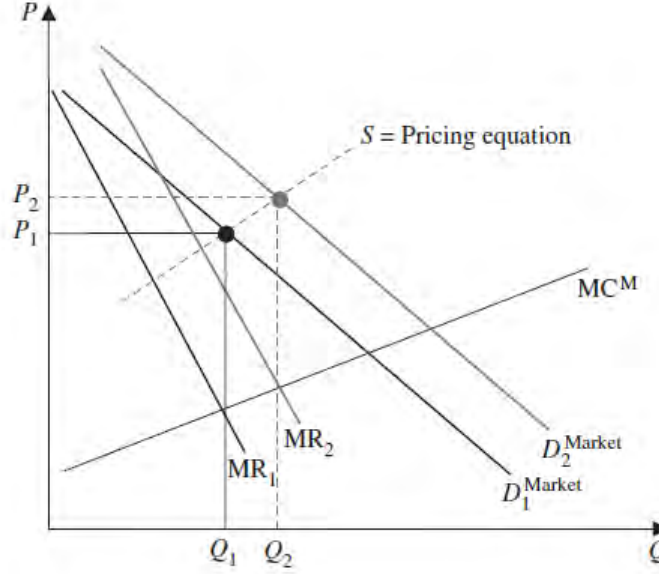
The supply equation is defined as below

$$P_t = \theta \left(-\frac{Q_t}{\alpha_0} \right) + \beta_0 + \beta_1 Q_t + \beta_2 W_t + \mu \quad \text{a7}$$

where θ is the conduct parameter. θ is equal to one if there is a monopoly or perfect collusion and zero if there is marginal cost pricing (perfect competition). Rearranging the supply function, I get:

$$P_t = \beta_0 + \left(\beta_1 - \frac{\theta}{\alpha_1} \right) Q_t + \beta_2 W_t + \mu \quad \text{a8}$$

Therefore, using the exogenous variables I can identify $\alpha_0, \alpha_1, \alpha_2, \beta_0, \left(\beta_1 - \frac{\theta}{\alpha_1} \right), \beta_2$ but I cannot separate the conduct parameter θ in the expression $\left(\beta_1 - \frac{\theta}{\alpha_1} \right)$. I can also see this graphically.



See Figure 1 in Bresnahan (1982)

The slope of the marginal cost curve does not allow us to identify the conduct parameter. However, suppose I alter the model by adding a variable that exogenously rotates demand. Then, I have:

$$Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 X_t + \alpha_3 P_t Z_t + \epsilon \quad \text{a9}$$

where Z_t is the exogenous variable. The supply function now becomes:

$$P_t = \theta \left(\frac{-Q_t}{\alpha_1 + \alpha_3 Z_t} \right) + \beta_0 + \beta_1 Q_t + \beta_2 W_t + \mu \quad \text{a10}$$

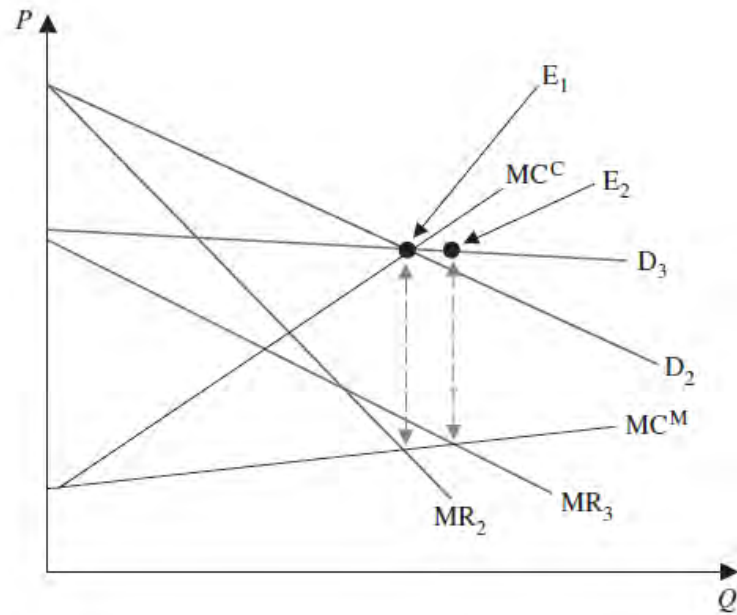
Since the demand parameters can be identified, define:

$$Q_t^* = \frac{-Q_t}{\alpha_1 + \alpha_3 Z_t} \quad \text{a11}$$

And the supply function can be written as:

$$P_t = \theta Q_t^* + \beta_0 + \beta_1 Q_t + \beta_2 W_t + \mu \quad \text{a12}$$

Now I can identify the slope of the marginal cost from variations in output and the conduct parameter from separate variations in Q_t^* . An example of this approach is Aw (1993) who considers a foreign exporter in a domestic market. Graphically:



See Figure 2 in Bresnahan (1982)

Alternatively, following Porter (1983), I can solve the identification problem by assuming $\theta_t = \{\theta^c, \theta^n\}$ takes two values, θ^c indicates the value under a collusion regime and θ^n indicates the value under a non cooperative regime. Note the different use of θ relative to Bresnahan: (1) θ varies over time according to a theory of repeated interaction; (2) no attempt to measure which equilibrium is being played in each period just document that there are 2 different states (the assumption is that the equilibrium being played is constant within a regime). Ellison (1994) re-examines the Porter model, generalizing it in several ways. He also looks at Rotemberg-Saloner theory, looks for triggers and looks for evidence of secret price c.

III. APPENDIX FIRST STAGE REGRESSIONS

Demand regression

First-stage regressions

Source	SS	df	MS	Number of obs = 64
Model	1.21258223	6	.202097039	F(6, 57) = 28.62
Residual	.402563704	57	.007062521	Prob > F = 0.0000
				R-squared = 0.7508
				Adj R-squared = 0.7245
Total	1.61514594	63	.025637237	Root MSE = .08404

lnPrice	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
lnpertonmaize	-.2120463	.1970908	-1.08	0.287	-.6067138 .1826212
lncereal	1.807459	.3479746	5.19	0.000	1.110652 2.504266
lnCpriceindex	-.3143028	.1554768	-2.02	0.048	-.6256398 -.0029658
lnSAFEXP	.4955834	.1438332	3.45	0.001	.2075623 .7836044
lnave_OC	-.2886723	.2384351	-1.21	0.231	-.7661304 .1887858
dcartel	.1967542	.0572749	3.44	0.001	.0820633 .3114452
_cons	5.830016	2.008345	2.90	0.005	1.808374 9.851658

Instrumental variables (2SLS) regression

Number of obs = 64
F(4, 59) = 20.88
Prob > F = 0.0000
R-squared = 0.5612
Root MSE = .02972

lnQuantity	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]
lnPrice	-.1315293	.0694811	-1.89	0.063	-.2705607 .007502
lnpertonmaize	-.2359103	.067139	-3.51	0.001	-.370255 -.1015655
lncereal	.3467191	.1639787	2.11	0.039	.0185985 .6748398
lnCpriceindex	.1221673	.0301006	4.06	0.000	.0619362 .1823984
_cons	13.7483	.5176645	26.56	0.000	12.71246 14.78415

Instrumented: lnPrice

Instruments: lnpertonmaize lncereal lnCpriceindex lnSAFEXP lnave_OC dcartel

Supply equation

First-stage regressions

Source	SS	df	MS	Number of obs =	64
Model	.068500642	6	.011416774	F(6, 57) =	12.95
Residual	.050232511	57	.000881272	Prob > F =	0.0000
				R-squared =	0.5769
				Adj R-squared =	0.5324
Total	.118733152	63	.001884653	Root MSE =	.02969

lnQuantity	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnSAFEXP	-.0464574	.0508083	-0.91	0.364	-.1481992	.0552844
lnave_OC	.2943123	.0842258	3.49	0.001	.1256529	.4629716
dcartel	.0339423	.020232	1.68	0.099	-.0065716	.0744562
lnpertonmaize	-.0672376	.0696212	-0.97	0.338	-.2066516	.0721765
lncereal	.03555	.12292	0.29	0.773	-.2105931	.2816931
lnCpriceindex	.1000223	.0549213	1.82	0.074	-.0099557	.2100003
_cons	10.5204	.7094364	14.83	0.000	9.099777	11.94102

Instrumental variables (2SLS) regression

Number of obs = 64
F(4, 59) = 31.69
Prob > F = 0.0000
R-squared = 0.6360
Root MSE = .09982

lnPrice	Robust					
	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
lnQuantity	-2.632941	1.983483	-1.33	0.189	-6.601881	1.336
lnSAFEXP	.4895246	.0710289	6.89	0.000	.347396	.6316531
lnave_OC	.9792609	.8704346	1.13	0.265	-.7624747	2.720996
dcartel	.2160915	.106169	2.04	0.046	.0036478	.4285351
_cons	30.5082	18.59008	1.64	0.106	-6.690452	67.70686

Instrumented: lnQuantity

Instruments: lnSAFEXP lnave_OC dcartel lnpertonmaize lncereal
lnCpriceindex

III. ESSAY THREE

STRATEGIC ENTRY DETERRENCE: PIONEER FOODS AND THE BREAD CARTEL

1. Introduction

Predatory pricing is exclusionary conduct in which the predatory firm sacrifices short run profits in order to achieve long run gains, in doing so causing rivals to exit and social welfare to be reduced. On one hand, predatory pricing can be anti-competitive, but on the other hand price reductions are the essence of competition. The debate on predatory pricing has been highly contested and has intrigued the competition policy community for more than a century. Some still argue that predatory pricing is as rare as dragons.¹⁰⁶ Modern explanations of predatory pricing are mostly about asymmetric information and these explanations also focus on a monopoly excluding weaker rivals.¹⁰⁷ A notable exception to this literature is Harrington (1989) who studied collusion and predation under free entry.¹⁰⁸

In December 2007, the Commission received a complaint from Mossel Bay Bakery. Mossel Bay Bakery alleged that Sasko owned by Pioneer Foods (Pty) Ltd engaged in predatory pricing. Mossel Bay Bakery alleged further that, Sasko threatened it with price wars if it did not increase its price of bread. Mossel Bay Bakery also alleged that Pioneer Foods baked bread in Worcester, 300km away and transported it to Mossel Bay but sold its bread at a lower price in Mossel Bay than in Worcester, in an attempt to drive Mossel Bay Bakery out of the market. If true, the alleged conduct could be in contravention of section 8 (c) of the Competition Act (dealing with anticompetitive general exclusionary conduct) and/or section 8 (d) (iv) (dealing with anticompetitive below average variable cost pricing).

In February 2010, after contested proceedings, the Tribunal found that Pioneer Foods had been involved in a conspiracy to fix the prices of bread as well as market allocation in the Western Cape province and nationally. Further, while the Commission alleged that Pioneer Foods had engaged in anticompetitive predatory pricing in several towns in the Western Cape, Pioneer Foods admitted in November 2010 that this conduct impeded small independent bakeries from expanding within the market and competing effectively, in contravention of section 8 (c) of the

¹⁰⁶ See Easterbrook (1981).

¹⁰⁷ For a survey of this literature see Kobayashi (2010) and Ordover and Saloner (1989).

¹⁰⁸ See Harrington (1989).

Competition Act, as part of the Pioneer Foods consent and settlement order concluded by the Tribunal.¹⁰⁹

I explore the relationship between strategic entry deterrence and the ability of colluding firms to maintain cartel profits in the presence of entry threats. Using Pioneer Foods' admission to having engaged in predatory price wars, I focus on the following questions. First, how did Pioneer Foods and the bread cartel respond to entry? Second, how effective was Pioneer Foods' conduct in maintaining collusion under the threat of entry. Section 2 discusses the literature on predatory pricing while section 3 outlines the relevant legislation for dealing with predatory pricing complaints. Section 4 provides background information of the bread industry, in particular the bread cartel in the Western Cape and section 5 presents a model and discusses the results. Section 6 concludes.

2. Literature

Predatory pricing has given rise to a large and often conflicting economic literature. Before the 1980s theoretical and empirical literature on price predation resulted in widespread skepticism regarding the rationality and frequency of predatory pricing. Sceptics argued that price cutting is the essence of competition, that imposing liability on a firm for setting its prices too low should only been done with great caution, if ever, and that successful predation, if it happens at all, is extremely rare. For a detailed review of the predatory pricing literature, see Kobayashi (2010) and Ordover and Saloner (1989).

McGee's (1958) influential article on the Standard Oil case provides the most appropriate starting point in reviewing the predation literature. Before McGee's review, the consensus was that the Standard Oil case provided the classic case study in which local price predation was achieved. First, McGee challenged as a factual matter, whether Standard Oil had engaged in predatory pricing. McGee's review of the record found that there was little or no evidence that Standard Oil systematically used local predatory pricing to monopolise the oil refining industry.

Second, McGee argued, as a theoretical matter, that predatory pricing would only be an optimal strategy under very strong assumptions. McGee emphasized that better monopolising strategies exist, why would a monopolist engage in predatory pricing when it could simply and more profitably acquire its rivals? McGee pointed out that threat of predatory pricing was not credible. A monopolist would lose more by predatory pricing when it could just co exist with a rival.

¹⁰⁹ See Bonakele and Mncube (2012).

McGee noted that driving a rival from the market might do little to increase the predator's market power, because other entrants would enter. McGee questioned why the prey could not credibly survive the predatory pricing by drawing on internal funds or borrowing as needed.

McGee's review initiated a vast literature that also questioned the theoretical and empirical relevance of predatory pricing. For example, while Easterbrook (1981) covered the same ground as McGee, he elaborated on a number of issues. Following Selten (1978), Easterbrook criticised the credibility of a threat to predate in multiple markets. Selten (1978) used game theory to demonstrate how rational players could undermine threats of predation in multiple markets. Selten's argument is commonly known as the "chain store paradox". Many others, followed McGee in reviewing other cases where predatory pricing was alleged. Similar to McGee, this literature found little or no evidence of profitable predation. For example, Koller (1971), reviewed 31 cases of alleged predation, and found few instances of successful predation.¹¹⁰

Ordover and Saloner (1989) provide a survey of post-1980 theoretical literature which sought to respond to McGee, Easterbrook, Koller and other skeptics. Ordover and Saloner summarise this literature into three classes of models based upon asymmetric information: (1) asymmetric financial constraints, (2) reputation based models, and (3) signaling models.¹¹¹

The first class is the well-known "deep pocket" model.¹¹² Under this model, the smaller firm would earn positive profits, but for predation. By depleting the rival's financial resources, or credibly threatening to do so, the predator can induce exit or deter entry. Bolton and Scharfstein (1990) show how deep pocket predation can occur even if the prey and its lenders are sophisticated. In their model, lenders' decisions regarding external financing are sensitive to a firm's short term performance. This gives managers incentives and addresses manager shareholder agency costs. However, a predator knowing this relationship between a firm and its lender can take advantage of it by using price predation to lower current profits, which in turn reduces external financing and induces exit. The use of financial contracting by potential entrants to reduce the threat of predation, and the effect of renegotiation on its effectiveness is further examined by Snyder (1996).

¹¹⁰ Following McGee's methodology, Elzinga (1970) re-examined the history of the gunpowder trust, and found that many of the alleged victims were not victims of predatory pricing, and that there was no conclusive evidence that any of the victims were subjected to predatory pricing. Adelman (1966) found little evidence of predatory pricing by A&P despite the government's successful prosecution for predatory pricing.

¹¹¹ These studies, as well as much of the literature on strategic entry deterrence, concentrate solely on the monopoly case. Their qualitative results can be expected to hold when the incumbents act as a cartel.

¹¹² Telser (1966) examines asymmetries favouring the incumbent, such as capital-market imperfections and related features that prevent competition on equal terms and later Benoit (1984) shows that moderate asymmetries can produce severely asymmetric outcomes. In Fudenberg and Tirole (1985) predation causes the entrant to have sufficiently little cash after entry that it cannot stay in the market; no bank will lend to it at a profitable interest rate.

In the second class of asymmetric information models, are reputational models of predation where the predator faces multiple markets entry. Selten's chain store paradox showed that predatory pricing is irrational in a finite game. In responding to the backward induction logic, reputational models demonstrate that predation may be rational (see the highly influential work by Milgrom and Roberts (1982b) and Kreps and Wilson (1982)). For example, Milgrom and Roberts consider a finite sequence of different entrants, all of whom know that fighting entry is costly for the incumbent. For the incumbent failure to fight any entry might reveal that fighting entry is unprofitable and induce subsequent entrants to enter. The incumbent's readiness to fight deters potential entrants, even if the early entrants are well informed and therefore initial predation may be rational.

The third class of asymmetric information models are signaling models of predation. In these models, predation occurs when the entrant is unsure about either the incumbent's costs¹¹³ or market demand.¹¹⁴ And the incumbent wishes to credibly signal information about demand and costs. Signaling models include models of limit pricing where lowered prices are used to deter entry.¹¹⁵ Other theories of predation include Cabral and Riordan (1997, 1994) and Marx and Shaffer (1999).¹¹⁶ Fumagalli and Motta (2009) show how based on scale economies and sequential buyers (or markets), the entrant needs to reach a critical scale to be successful but the incumbent is ready to make losses on earlier buyers so as to deprive the prey of the scale it needs, thus making monopoly profits on later buyers. The examples of the literature cited above focus on the monopoly case, while their results can be expected to hold for the cartel case, Harrington (1989) studies whether cartel members can sustain cooperation over time under the threat of free entry in an infinitely-repeated game and shows that firms can deter entry by credibly threatening to meet any entry with an episode of below cost pricing.¹¹⁷

¹¹³ See Salop and Shapiro (1980), Milgrom and Roberts (1982a), Saloner (1987)

¹¹⁴ Roberts (1986) examines a similar model where information is incomplete as to demand rather than cost. In addition, there is earlier literature on 'test market predation' (Sharfstein (1984), describing an earlier model by Salop and Shapiro (1980)) in which there could be signaling in a local or 'test' market competition that occurs prior to competition at the national level.

¹¹⁵ For example, Saloner (1987) adapted the Milgrom and Roberts (1982a) limit pricing model to consider how predatory pricing can be used to induce the exit of an existing competitor

¹¹⁶ Cabral and Riordan (1997, 1994) have a learning curve model of equilibrium predation, in which firms' current period production costs are a function of the cumulative production. In such a learning curve environment, Cabral and Riordan show that rational predation occurs in equilibrium, where the predator expands output and lowers price in order to further take advantage of the learning curve cost reductions and to induce its rival's exit.

¹¹⁷ Harrington (1984) develops a model to solve an entry game between a duopoly and a potential entrant when there is a certain type of informational asymmetry. The two incumbent firms know whether they are able to collude, but the potential entrant does not. Asymmetric information is shown to result in entry's being deterred which would have occurred under complete information. For the incumbent firms to deter entry, however, they must price more competitively to reduce current profits. A high pre-entry profit rate is endogenously derived to be a signal to the potential entrant that entry is profitable.

The empirical evidence on predation has also been hotly debated since the 1950s. Similar to the post-Chicago School literature, recent empirical studies have challenged the findings of the Chicago School. For example, Zerbe and Cooper (1982) updated and expanded Koller (1971) study. However, in contrast to the low rate of successful predation reported by Koller, Zerbe and Cooper (1982) found that the predator was successful, or would have been successful but for a lawsuit, in raising prices in 27 out of 40 cases. A limitation of empirical studies of litigated cases is that it is unclear what inferences can be made from the results. Litigated cases are a highly selected sample of cases, and may not be representative, in either frequency or substance, of the larger universe of cases, including settled or dropped cases and cases never filed, see Priest and Klein (1980). Bolton et al. (2000) argue that proof of predation in litigation cases is not rare, and may be considerably higher if settled cases were taken into account.

Burns (1986) found evidence that predatory pricing by American Tobacco enabled it to acquire its rivals, those who were targets of the predation and others based on reputational effects, on more favourable terms using regression analysis. Burns found statistically significant coefficients consistent with predation reducing the cost of acquiring competitors through both reputation and direct effects. Burns estimates the effect of reputation was to reduce the acquisition costs by 25 per cent, with an additional discount of 56 per cent resulting from preying on the relatively smaller fine cut tobacco, snuff, and smoking tobacco firms. Morton (1997) used regression analysis to examine pricing by ocean shipping conferences in response to entry, and found evidence consistent with the long purse theory. Morton found evidence of the deep pocket theory of predation. Morton's main result was that new and smaller entrants were more likely to experience price wars. Weiman and Levin (1994) using regression analysis, found that Southern Bell Telephone priced below cost, especially in areas where it competed with rival networks. Further, telephone prices fell immediately prior to new entry and prices fell further after new entry.

Genesove and Mullin (2006) provided direct evidence of predation through below-cost pricing in the American sugar industry before World War 1 by comparing sugar prices to a direct measurement of marginal cost. Genesove and Mullin found episodes of prices that were below marginal cost and they constructed competitive price-cost margins, and showed that actual margins were lower than these constructed margins. Genesove and Mullin's work is most closely related to this paper, in that I also provide direct evidence of predatory pricing.

Experimental methods have also applied to predatory pricing (see Plott (1989), Normann (2007)). Issac and Smith (1985) examined predation in an experimental setting designed to be conducive to the observation of predatory pricing and it was not observed. Harrison (1988) extended the

Issac and Smith experiments to a setting where the monopolist faced a single entrant in multiple markets. In this setting, Harrison found some evidence of predatory pricing, but the evidence is weak given that only one trial looked at multiple markets. Gomez et al. (2008) report that predation was not observed in three replications of the Harrison experiments. An interesting question arises from the above examples, what can I learn from the empirical evidence on predatory pricing? It appears the answer depends on how I define predatory pricing.

3. Relevant legislation

Legal rules in competition policy are aimed at minimising the sum of direct costs and error costs. Error costs include the costs of Type I and Type II errors. Type II errors include allowing anticompetitive predatory pricing while Type I errors include falsely labelling price cuts as anticompetitive when in fact they are welfare increasing or deterring efficient price competition from occurring in the first place. Areeda and Turner (1975) provide the seminal article on the cost based test applied to predatory pricing cases. Their work is premised on the observation that in perfectly competitive markets, price equals short-run marginal cost. Areeda and Turner (1975) propose that prices above short run marginal cost should be lawful, while prices below short run marginal cost unlawful. The short run period is suggested because a firm does not change production assets. However, it is difficult to observe, let alone measure marginal cost. Areeda and Turner (1975) suggest the use of average variable cost (“AVC”) as a more easily observable proxy. In this case, prices below AVC would be presumptively unlawful.

According to Areeda and Turner (1975), a price below AVC is irrational for a profit-maximising firm, whereas a price above AVC is, in the short-run at least, sustainable and therefore a reasonable benchmark for a legitimate price. The implicit assumption here is the argument that competition law should only protect firms which are at least as efficient as the dominant firm. The Areeda and Turner test has had a major influence on predatory pricing laws in many developing and developed countries, including South Africa. In Europe, the European Court of Justice (“ECJ”) framed the Areeda and Turner test in its AKZO decision in the following manner;¹¹⁸ (1) prices set by a dominant firm below its AVC are presumed abusive; (2) prices above AVC but below average total costs are abusive if they are intended to eliminate a competitor; and (3) prices above average total costs are conclusively legal.

¹¹⁸ Case C-62/86, AKZO Chemie BV v. Commission, 1991 E.C.R. I-3359 ¶¶ 70-73 (E.C.J. (holding that above variable cost but below total cost pricing is illegal if intended to eliminate a competitor)).

Because of problems with the classification of fixed and variable costs, the allocation of common fixed and variable costs between two or more products, and developments in economic thinking have led others to propose certain modifications to the Areeda and Turner test. de la Mano and Durand (2005) argue for a three-step structured rule of reason to establish a presumption that the observed practice is predatory, that is;¹¹⁹ (1) the sacrifice of short-run profits (actual sacrifice); (2) the negative impact on rival profitability which may induce a prey to exit, reduce its scale or stay out of the ‘sacrifice’ market or closely related markets (likely exclusion); and (3) the ability to recoup the initial profit sacrifice by exercising increased market power after the predatory phase (likely recoupment).

In December 2008, the European Commission issued its guidance paper on enforcement priorities in applying Article 82 EC to exclusionary conduct by dominant firms (“Guidance Paper”). According to the Guidance Paper, pricing below average avoidable cost (“AAC”) is a clear evidence of sacrifice. AAC involves comparing the incremental cost of remaining in the market with the avoidable cost of exiting it. A rational firm would not sell below its AAC. It makes more economic sense for firm to exit the market, if avoidable costs exceed the incremental costs.

The AAC test has the advantage of not requiring the identification of fixed and variable costs. While the AAC overcomes some challenges associated with the Areeda and Turner test, it can raise significant practical problems. First, the AAC test does not avoid the difficulty under the Areeda and Turner test of defining the appropriate time period over which avoidable costs should be identified. Second, some assets are transferable assets between markets. Assets that can be transferred between markets result in much larger avoidable costs than those which cannot. Third, demand complementarity means that prices that are below AAC may be recovered if the loss-leading sales generate follow-on revenues in other higher margin products. Fourth, a dominant firm could minimise losses by reducing sales and charging a higher price than by exiting. Finally, considerable accounting problems may arise in measuring avoidable costs.

The Guidance Paper suggests that pricing above AAC but below long-run average incremental cost (LRAIC) may be also viewed as abusive under specific circumstances. Recoupment is not expressly mentioned although the Guidance Paper states that consumers are likely to be harmed where the dominant firm is, as a result of its conduct, “likely to be in a position to benefit from the sacrifice”. This appears to imply that a possibility of recoupment is required under the Guidance Paper’s predation test. The differences between the Guidance Paper and the U.S. test for predation under Brooke Group case is that the U.S. test captures only pricing below average

¹¹⁹ See De la Mano and Durand (2005), Three-Step Structured Rule of Reason to Assess Predation under Article 82.”Discussion Paper, Office of the Chief Economist. DG Competition. European Commission.

variable cost, whereas the Guidance Paper focuses on sacrifice; and while probability of recoupment is required in the U.S., a mere possibility is sufficient under the Guidance Paper.¹²⁰

In the case of the South African competition law regime, the relevant applicable sections of the Competition Act under which allegations of predatory pricing by a dominant firm are assessed include section 8 (c). Section 8 (c) prohibits a dominant firm from engaging in exclusionary conduct defined in general terms, with no penalty for a first contravention and with the onus on the complainant to demonstrate that the anti-competitive effect outweighs its technological, efficiency or other pro-competitive benefits. An exclusionary act is defined as that which impedes or prevents a firm entering into, or expanding within, a market. Section 8 (d) identifies particular types of exclusionary acts that are prohibited as an abuse of dominance, and where a penalty may be imposed for a first contravention and the onus on the Commission to demonstrate that the anti-competitive effect outweighs its pro-competitive benefits. The types of conduct specified under section 8 (d) include selling goods or services below their marginal or average variable cost in section 8 (d) (iv).

In the Nationwide/SAA case, the Tribunal set out the test for predatory pricing.¹²¹ First, the Tribunal argued that the complainant must establish that the respondent is pricing below cost for a sustained period and that this price-cost relationship need not be the one referred to in 8 (d) (iv) but should have some support in the literature as an appropriate measure of costs. Second, the Tribunal stressed the need for some additional evidence of predation. The Tribunal further stated that if the complainant is relying on the provisions under section 8 (c) and can show that the respondent costs are below some other appropriate measure of costs, it may prevail provided it adduces additional evidence of predation beyond mere evidence of recoupment.

4. The bread industry: A historical background

A. BACKGROUND

The bread industry was extensively regulated up until 31 March 1991. Through legislation a quota system was established, product specifications (such as weight, height and width per loaf) were prescribed, prices at which bread was sold were set and volumes to be produced and distribution areas for each producer determined. Bread prices were subsidised by government and

¹²⁰ Brooke Group Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209 (1993).

¹²¹ Competition Tribunal case number 92/IR/Oct00. Available at <http://www.comptrib.co.za/assets/Uploads/Case-Documents/92IROCT00.pdf> and assessed on 19/07/2012

there was no value added tax on bread. In this environment, there were approximately 370 bakeries country-wide which included the four largest national bakeries and smaller independent brands.

During the regulated period, regular meetings took place between bread producers largely, although not exclusively, under the auspices of the Chamber of Baking, to which all of the bakers belonged. Bread producers discussed various issues including circumstances in which producers were encroaching on each other's allocated areas and where producers were exceeding their volumes, together with compensation that those violating the agreements were obliged to pay. A culture of co-operation and information sharing on prices, volumes and market allocation was entrenched in the industry over many decades. Market participants knew the price of bread (determined by government), each other's distribution territory and volumes sold by the various producers.

With deregulation, the legislative impediment to competition was removed. However, bread producers continued with their interaction with regard to common issues such as labour relations and missing bread crates. The Chamber of Baking also continued as a forum for sharing information on the industry where issues such as deliveries of wheat, quality of wheat, unscrupulous bakers and security concerns were discussed freely and legitimately. Deregulation allowed for the growth in smaller and in-store bakeries. Together with the removal of prescribed delivery zones/routes and production quotas, this put pressure on the costs per unit of plant bakeries.

There are four primary bakeries who enjoy a combined market share of between 50- 60 per cent of the domestic bread market in South Africa. Blue Ribbon Bakeries owned by Premier Foods, Albany Bakeries owned by Tiger Consumer Brands, Sasko and Duens Bakeries owned by Pioneer Foods and Sunbake Bakeries owned by Foodcorp .The remainder of the market is served by smaller independent bakeries. The four primary plant bakeries are all vertically integrated. Their milling operations account for more than 90 per cent of all milled wheat. As milling companies they sell flour to the independent bakeries. Plant bakeries and independent bakeries produce similar products and are competitors with each other.

Wheat flour is the main ingredient used to bake bread. The cost of wheat flour constitutes approximately 41 per cent of the cost per loaf of bread. The bakeries' bread recipes are similar since they contain the same ingredients. The costs of operating a plant bakery are also comparable, as are the costs of distribution which are mainly driven by fuel prices. The bakeries' input costs essentially comprise wheat flour, fuel and labour are therefore similar and are subject to the same price fluctuations. Customers tend to be classified into three categories (retail, general

trade and agents). Retail customers are the large retail groups. The general trade comprises smaller entities such as spaza shops, cafes and smaller retailers and the final category includes a variety of agents such as resellers and independent distributors. The largest single buyer of bread are the large retail customers (supermarkets) who purchase approximately 30 per cent of the bakeries' production.

Plant bakeries set their prices nationally. Pioneer Foods sells its bread to distributors and retailers at a discount or rebate off the list price. The list price is therefore not the actual price paid by the customer. Once the list price is determined Pioneer Foods, in common with the practice employed by its competitors, will inform its various retail customers of the change in price. Pioneer Foods' national sales managers, who are responsible for the actual bread prices for the national key accounts, being the large supermarket chains, forecourts and convenience franchises meet with the respective buyers of these important retailers in order to communicate the price adjustment and, critically, to negotiate discounts before the net price is loaded on to the large retailers' systems. Increases to the general trade customers and distributors will be communicated by letter usually delivered together with the bread.

Pioneer Foods' bakery managers are responsible for determining the actual bread price for smaller customers, local supermarkets, convenience stores and distributors and will take regional competition into consideration when determining the bread price. The primary plant bakeries in the Western Cape province which collectively account for approximately 60 per cent of bread sales are Tiger Brands, Pioneer Foods and Premier Foods.

B. THE BREAD CARTEL

In December 2006, the Commission received information of an alleged bread cartel operating in the Western Cape province. Following a preliminary investigation, the Commission initiated a complaint against Premier Foods, Tiger Brands and Pioneer Foods, all of whom allegedly had been involved in a bread cartel.

During the Commission's investigation into the Western Cape complaint, Premier Foods applied for leniency, indicating its willingness to fully co-operate with the Commission on its role in the bread cartel. Premier Foods disclosed to the Commission that it was a member of a bread cartel together with Tiger Brands and Pioneer Foods, fixing selling prices and other trading conditions. Premier Foods also revealed that the bread cartel operated in other parts of the country and that the cartel allocated markets. Cartel agreements were used to secure co-ordination at both national

and regional levels and were mutually reinforcing. Based on this information, the Commission proceeded to initiate a second investigation into the allegation that a bread cartel operated in other parts of the country.

Tiger Brands followed Premier Foods and corroborated the information provided by Premier Foods. Tiger Brands provided further evidence on the bread cartel, including additional information that the bread cartel was also fixing flour and maize meal prices. On 28 November 2007, the Tribunal imposed a fine of R98 million on Tiger Brands for its role in the bread cartel. This represented about 5.7 per cent of its turnover from baking for the financial year 2006. Foodcorp, a respondent in the national complaint, entered into a settlement agreement with the Commission and on 6 January 2009 the Tribunal confirmed the settlement agreement and imposed a fine of R45 million on Foodcorp. This represented 6.7 per cent of its turnover for baking operations for the financial year 2006. Pioneer Foods however, at this stage, denied that it was involved in a Western Cape cartel. After contested proceedings, on February 3, 2010 the Tribunal ruled that Pioneer Foods had engaged in fixing the price of bread products in the Western Cape province and nationally and imposed on Pioneer Foods a fine of R196 million.

Pioneer Foods conceded that it had, in respect of the Western Cape complaint, acted in contravention of section 4(1) (b) of the Competition Act (the section that prohibits collusion). This concession only came at the end of the hearings during legal argument. Pioneer Foods admitted that it co-operated with its competitors in fixing the price of standard bread, the discount granted to the agents or resellers and in fixing the price of toaster bread. It also admitted to market sharing arrangements.

Up until it was disbanded in 2002, meetings of the Western Cape Chamber of Baking took place regularly. These were chaired by Pioneer Foods. It was common practice for the participants to discuss prices of bread after the conclusion of the official business of the meetings. With the disbandment, informal meetings continued to be convened every 4 - 5 months to discuss, inter alia, the price magnitude and timing of the price increases and discounts to agents. Agreements that arose from these informal meetings were sometimes not honoured. Cheating was generally in terms of granting confidential discounts particularly to the large retailers. This generated a retaliatory response from the other cartel members thus reducing the net margin gained from an agreed increase.

Informal meetings were discontinued after a meeting held in October 2003 broke up in considerable acrimony precisely because of perceptions of cheating on pricing agreements. However, ad hoc contact between representatives of the plant bakeries continued even after these informal 'post-chamber' meetings had been terminated. For example, in December 2006 Premier

Foods, Pioneer Foods and Tiger Brands contravened section 4 (1) (b) (i) and (ii) of the Competition Act¹²² in that they met and agreed that (1) all three firms would increase the discounted price of toaster bread on 5 February 2007 to realise R4.25 per loaf including tax; (2) all three firms would increase the price of the standard loaf of bread by 35c per loaf from 18 December 2006; (3) the dates by which the bread price increases were to be implemented would be staggered so as not to be implemented on the same date; (4) discounts given by all three firms to agents in the Paarl and Cape Peninsula area would be capped at 90c and 75c respectively; (5) none of the firms would supply new distributors; (6) none of the firms would supply each other's former employees; and (7) none of the firms would make bread deliveries on 25 and 26 December 2006.

The Tribunal found that Pioneer Foods had indeed been involved in a conspiracy to fix the increase of the price of a standard loaf of bread in the Western Cape as well as the timing of the price increase. In addition, to Pioneer Foods' concessions regarding the fixing of the agents' commissions and the various market allocations, the Tribunal found that Pioneer Foods' conduct amounted to a comprehensive contravention of Section 4(1) (b) (i) and (ii) of the Competition Act.

5. Collusion and predation

This section sets out in sufficient detail Harrington (1989)'s model which is relevant to the issues at hand. Harrington (1989) studies whether cartel members can sustain cooperation over time in a perfect-information, infinitely repeated game under the threat of free entry and shows that firms can deter entry by credibly threatening to meet any entrant with an episode of below-cost pricing. In the free entry equilibrium, when firms do not collude, the response of the incumbent firms to entry is the single-period Nash equilibrium.

However, when firms collude, one response of incumbent firms to entry is defined by the cartel breaking up. When firms attempt to support cooperation by threatening to break up the cartel in response to either internal or external defection, price cannot be kept significantly above the competitive level when the cost of entry is low. Since single-period Nash equilibrium profits are always positive, the threat of discontinuing collusion is not a sufficiently severe punishment so as to allow active firms to maintain a significant degree of cooperation when the threat of entry is strong.

¹²² These two sections prohibit price fixing and market allocation respectively

The other response, when firms collude, is defined by the cartel surviving entry. Incumbent firms can either accommodate the entrant by achieving a collusive outcome or coordinate in punishing the entrant. The strategy of the incumbent firms may or may not entail driving the new entrant out of the industry.

To illustrate the normal form model, assume there is large pool of active and inactive firms which are represented by Z . Let A^t be a subset of Z denoting active firms and N^t the number of active firms, both for period t where $t = 1, 2, \dots$. The set of potential entrants in period t is then represented by $Z - A^t$. A firm which is 'active' chooses an output rate while a firm which is 'inactive' decides whether or not to enter the industry. All active firms offer a homogeneous product where the inverse market demand function is $P(Q)$; Q being the industry output rate. Each firm has the same cost function $C(q_i)$ where q_i is the output rate of firm i . The single-period profit function of firm i is then $\Pi(q_i, Q_{-i}) \equiv P(q_i + Q_{-i})q_i - C(q_i)$ where $Q_{-i} = Q - q_i$ and $\pi(q, n) \equiv \Pi(q, (n-1)q)$.

Assume further that, there exists \bar{Q} such that $P(Q) = 0$, iff $Q \geq \bar{Q}$. $P(Q)$ is twice differentiable, bounded and $P'(Q) < 0$; $\forall Q \in [0, \bar{Q}]$. $C(q_i)$ is twice differentiable and $C(0) = 0$. $P(0) > C'(0) > 0$, and $C''(q_i) \geq 0$; $\forall q_i \geq 0$. $\Pi(q_i, Q_{-i})$ is quasi-concave in q_i and $\pi(q, n)$ is strictly quasi concave in q . These assumptions are conducive to entry. Ignoring any cost of entry, the firm cost function exhibits non-increasing returns to scale so that minimum efficient scale is arbitrarily close to zero. A decision to enter incurs a non-recoverable cost K , where $K \geq 0$, and allows the firm to begin production in the following period.

Suppose incumbent firms respond to entry by accommodating the entrant and achieving a new collusive outcome. Let $q'(n) \in [q^m(n), q^c(n)]$ denote the firm collusive output rate when there are n active firms. If N^t active firms are colluding in period t and pursue a policy of accommodation, a potential entrant can anticipate firms shifting production from $q'(N^t)$ to $q'(N^t + 1)$ in response to entry. Suppose that internal defection is punished by discontinuing collusion. A free-entry equilibrium is then defined by the function $q'(n)$ and a number of firm, \hat{n} , such that the following conditions are satisfied:

$$\left(\frac{\delta}{1-\delta}\right)[\pi(q'(n), n) - \pi^c(n)] \geq \pi^*(q'(n), n) - \pi(q'(n), n); \quad \forall n \geq 1 \quad (1)$$

$$\left(\frac{\delta}{1-\delta}\right)\pi(q'(\hat{n} + 1), \hat{n} + 1) - K \leq 0 \quad (2)$$

Whatever the market structure is, no active firm has an incentive to deviate from the collusive outcome as shown in equation 1. Entry is unprofitable when potential entrants anticipate collusion to be continued after entry according to equation 2. In this case, entry must be at least as profitable when active firms accommodate entry as when they discontinue cooperation. As the number of firms increases without bound, the single period Nash equilibrium price converges to the competitive price. If the cost of entry is positive but small then the number of active firms is relatively large so that the best cooperative price is found to be close to the competitive price. Therefore, when entry is accommodated, price cannot be kept significantly above the competitive level in the absence of significant costs to entry.

Following Abreu (1986), Harrington (1989) also considers the case when incumbent firms continue to collude after entry but instead of pursuing accommodation they coordinate in implementing a policy of predation. Abreu (1986) investigated more severe punishments than reversion to a single-period Nash equilibrium in order to derive the highest level of profits that a fixed number of firms can sustain as a sub-game perfect equilibrium. Abreu's work shows that the optimal punishment strategy can be used to deter entry as well as prevent cheating by active firms. Since the optimal stick-and-carrot punishment minimises the post-defection payoff for all active firms (subject to the punishment being symmetric), it then also represents the optimal punishment to be inflicted upon a new firm.

In defining the period t action function of an active firm, let t' be the most recent period for which there has been a defection. This implies that: $A^{t'} \neq A^{t'+1}$; $q^{t'} \neq \dot{q}(N^{t'})$; for some $j \in A^{t'}$; $q^{t'} \neq \bar{q}(n^{t'})$ for some $j \in A^{t'}$.

For this purpose, consider the strategy for incumbent firms:

$$S_i^1 = \dot{q}(N^1), \quad i \in A^1$$

$$S_i^t = \left\{ \begin{array}{l} \dot{q}(N^t) \text{ if } q_j^\tau = \dot{q}(N^t), \quad j \in A^\tau, \quad \tau = 1, \dots, t-1 \text{ and } A^\tau = A^1 \\ \tau = 1, \dots, t \text{ or } q_j^\tau = \bar{q}(N^\tau), \quad j \in A^\tau; \text{ for some } \tau \in \{t'+1, \dots, t-1\} \\ \bar{q}(N^t) \text{ otherwise} \end{array} \right\}$$

$$i \in A^t, t = 2, 3, \dots \quad (3)$$

A potential entrant's strategy is of the following form:

$$E_i^1 = \text{Do not enter}$$

$$E_i^t = \begin{cases} \text{Do not enter} & \text{if } i \text{ does not belong to } A^t \\ S_i^t & \text{if } i \in A^t \end{cases}$$

$$t = 2, 3, \dots, i \in Z - A^t, \quad (4)$$

For equation 4 to be a best response, it must be true that

$$\delta \pi(\bar{q}(n+1), n+1) + \left(\frac{\delta^2}{1-\delta}\right) \pi(q(n+1) - K) \leq 0 \quad (5)$$

A new firm will incur K upon entry and induce punishment profits of $\pi(\bar{q}(n+1), n+1)$ in the following period. As long as all firms stay on the equilibrium path, a new firm can expect to earn collusive profits for the remainder of the horizon. For all $n \geq 1$ and $K \geq 0$, there exists $\bar{\delta}(n) < 1$ such as a non trivial free entry optimal punishment strategy equilibrium exists if $\delta \geq \bar{\delta}(n)$.¹²³ This implies that for any initial market structure, incumbent firms can sustain a non-trivial degree of cooperation even if the cost of entry is very low.

The intuition behind Harrington's influential result is that firms will go through with the proposed punishment if and only if their discount factor is sufficiently high. But since deviation from the punishment entails trading off higher profits today for lower profits tomorrow (as a firm postpones returning to the cooperative outcome), a higher discount factor allows firms to credibly threaten a higher value for output or a lower punishment price and thus a lower punishment payoff. The severity of the punishment can then be made greater as the discount factor is raised, there is some minimum discount factor, such that it is credible to impose a punishment which yields each firm its mini-max payoff of zero (that is, the lowest payoff it can be held down to by the other firms). Thus, the joint profit-maximizing price can be sustained under free entry and without there being a high cost to entry.

In sum, it is possible for any initial market structure to sustain a price above the competitive level, even the joint profit maximizing price, regardless of the level of entry costs. Of course, in order for active firms to maintain a significant degree of cooperation, they must threaten entrants with a more severe punishment than simply breaking up the cartel. Abreu (1986)'s pioneering derivation of optimal stick-and-carrot strategies characterizes the type of punishment that will indeed allow cooperation to be sustained under the threat of entry.

¹²³ For proof see Harrington (1989)

Thus, if potential entrants expect the cartel members to respond aggressively to entry, the cartel members may be able to maintain price significantly above the competitive level despite low entry costs. However, a question arises as to when should the potential entrants expect cartelists to respond to entry with such aggressive behaviour? Cartel members might instead plan to accommodate entrants or entry may induce the cartel to break up. The source of this problem is that there exist multiple sub-game perfect equilibria for the infinite horizon game and, therefore, different possible outcomes for the post-entry game.

Pioneer Foods, the allocated cartel member in Mossel Bay and Worcester areas, first approached entrants with a proposal to accommodate them if they agreed to fix their prices. Pioneer Foods then realised that it was a self-defeating and unprofitable policy for an incumbent firm to accommodate entry when there is a large pool of potential entrants. Pioneer Foods' behaviour is summarised in the following allegations: (1) In Worcester, independent bakeries met with Pioneer Foods in 2002 in order to fix prices of bread. According to Ocean Bakery, Pioneer Foods wanted to have the price of bread fixed at R3.00 per loaf and threatened to engage in a price war if the other firms refused to do the same; (2) Wynland Bakery entered the Worcester market in 2002, and alleged that Pioneer Foods threatened that should Wynland Bakery continue charging prices below those charged by Pioneer Foods, Pioneer Foods would drop their price. According to Wynland Bakery, Pioneer Foods reduced its price of the Vita bread to R2.00 per loaf when Wynland Bakery refused to comply with Pioneer Foods' demands (3) Mossel Bay Bakery alleged that when it entered the Mossel Bay market in 2004, Pioneer Foods threatened a price war and that Pioneer Foods repeated its threats in 2007.

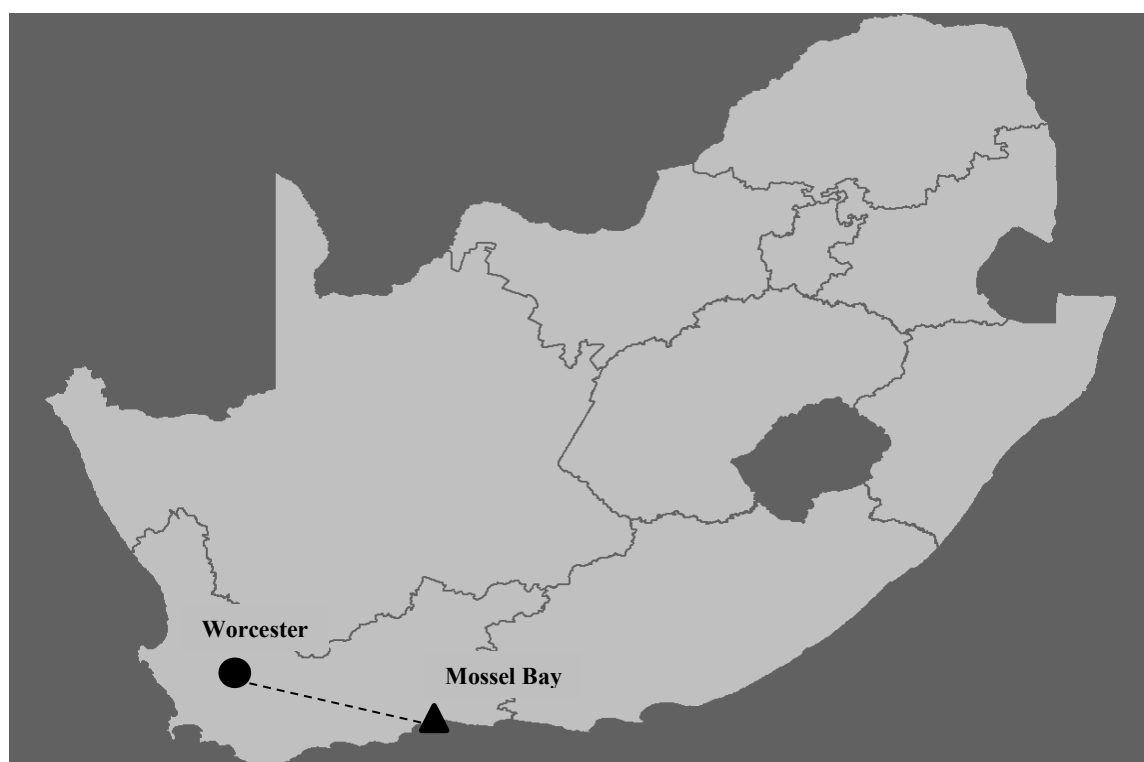
A. VARIABLES AND ESTIMATION

In this section, I describe the data and variables used in the empirical analysis. I deal here with monthly time series data. Private data was obtained during the investigation. To complement the private data, I include in the dataset monthly consumer price index data gathered from Statistics South Africa. This data captures monthly food prices and is provided by the South African Grain Information Service. The data available corresponds to the period which starts from January 2003 to December 2009 (84 months).

To determine whether a hypothetical competitor as efficient as Pioneer Foods would be likely to be foreclosed by Pioneer Foods' conduct requires examining Pioneer Foods' own monthly unit cost and prices. The *Price* variable is monthly unit "net sales realisation" price, that is, the price

after all discounts and/or rebates have been taken into account per loaf of standard 600g bread.¹²⁴ While bread is perishable and has a limited shelf life, it can be transported over long distances. For example, Pioneer Foods has a bakery in Worcester and supplies bread from this bakery to its depots in Mosselbay, Beaufort West and other areas. Figure 3-2 below shows the distribution network of Pioneer Foods from Worcester. I consider Pioneer Foods' prices in relation to standard bread in Worcester and Mossel Bay (about 300km away). In these towns, Pioneer Foods was the allocated cartel member in town (meaning that the other cartel members agreed not to supply) and was dominant.

Figure 3-1: Pioneer Foods' distribution from Worcester



The *average variable costs* variable includes input costs, activity costs and distribution costs. A firm's costs can be divided into those that vary with output and those that are fixed. Costs that do

¹²⁴ Bread is a homogenous product often made from wheat-flour dough that is cultured with yeast, allowed to rise, and finally baked in an oven. Owing to its high levels of gluten (which give the dough sponginess and elasticity), wheat is the most common grain used for the preparation of bread. There are many different variations of bread such as white bread, brown bread, whole wheat bread, rye bread etc. Sasko bakeries has 32 different kinds of bread products, for instance standard bread, English pan loaf, speciality loaves and sandwich loaves, etc. Sasko manufactures different types of bread (white, brown, homemade and health breads) under the brand names such as Sasko Sam, Daybreaker, Uncle Salie and Nature's Harvest. Apart from bread, Sasko also produces rolls and buns. The different kinds of bread have significantly different product attributes such as more pronounced tastes and denser, grainier textures which can be used in the segmentation of bread markets.

vary with output are the variable costs since they vary in proportion to output. Average variable costs are therefore equal to average total cost less average fixed costs.

Pioneer Foods is vertically integrated, active in the flour industry upstream, and the bread industry downstream. Due to transfer pricing, the price Pioneer Foods charges itself for flour may not be a true reflection of what it would cost Pioneer Foods to manufacture. Therefore, I use the price of flour that Pioneer Foods charges independent bakeries. The cost of flour used for a loaf white and brown bread flour is calculated from the price that Pioneer Foods charges to other independent bakeries for its 12.5kg white and brown bread flour in the Western Cape region. Other input costs used in the production and packaging of a loaf of bread are also included. The inputs used in the production of Pioneer Foods' 600g bread loafs are very similar with the only difference being the type of flour used in the production of the particular bread type. Activity costs per loaf of bread include the costs associated with production, electricity, oven fuel, direct depreciation on production equipment and maintenance of production equipment per loaf of bread. Distribution costs include monthly distribution costs per loaf of bread. Distribution costs include labour, fuel and vehicle maintenance costs.

B. EMPIRICAL RESULTS

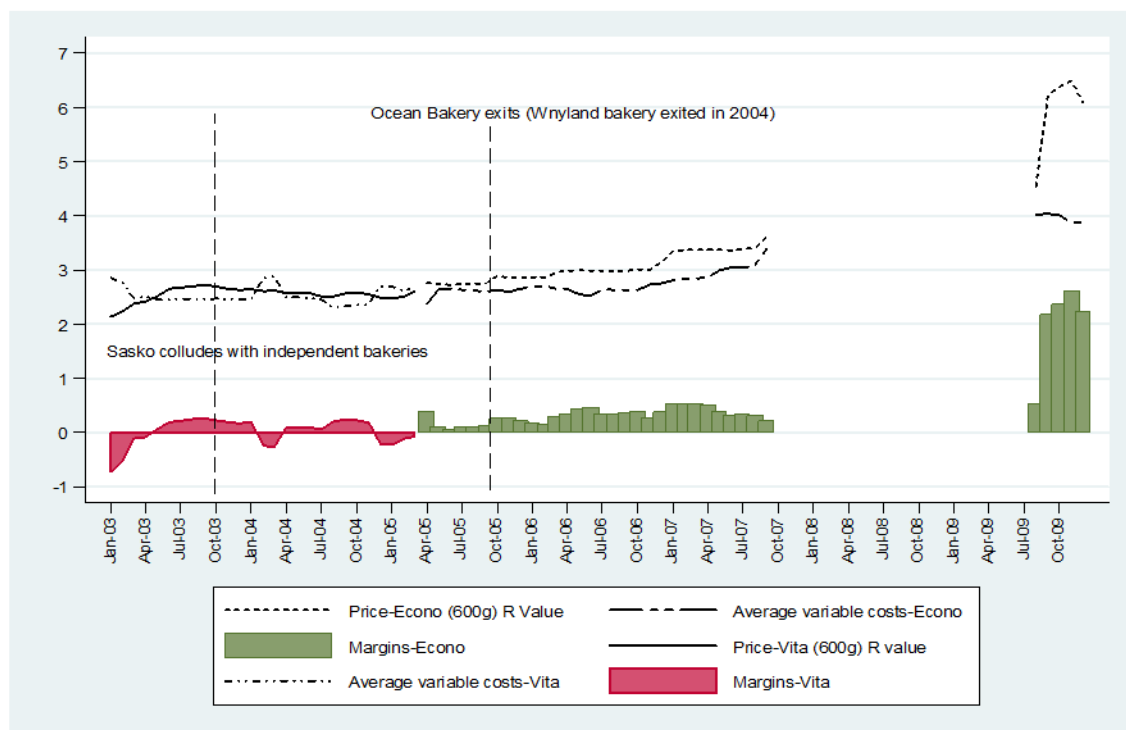
Recall that the legal standard for predatory pricing involves examining the relationship between price and average variable costs and/or marginal cost. Figure 3-3 shows Pioneer Foods' price, AVC and margins for Vita and Econo bread for the period January 2003 to October 2009 in Worcester. Pioneer Foods priced below AVC in early 2003 as well as from February 2004 until about July 2004. Vita bread was renamed Econo bread in April 2005. Ocean Bakery exited the market towards the end of 2005. Qualibake and Wynland Bakeries were closed down in 2004. Pioneer Foods' margins increased from around February 2006, after its competitors exited the market. Econo bread was removed from the Worcester market in September 2007.

In August 2009, Econo was re-introduced in Worcester but this time at a much higher price. Essential Vita and Econo bread brands were used as fighting brands. Vita and Econo brands were closet substitutes to the bread baked by independents and were targeted at LSM¹²⁵ category 1 to 4 while, it could be argued that Sasko Sam is high quality bread and targets LSM categories 1 to 7. Fighting brands confine predatory pricing to particular brands so that the dominant firm avoids

¹²⁵ Living Standards Measure, a common metric in South Africa for assessing standard of living. It divides the population into 10 LSM groups, 10 being highest and 1 the lowest.

losing money on all of its sales. By engaging in such a strategy the dominant firm may seek to limit the cost of its predatory strategy.

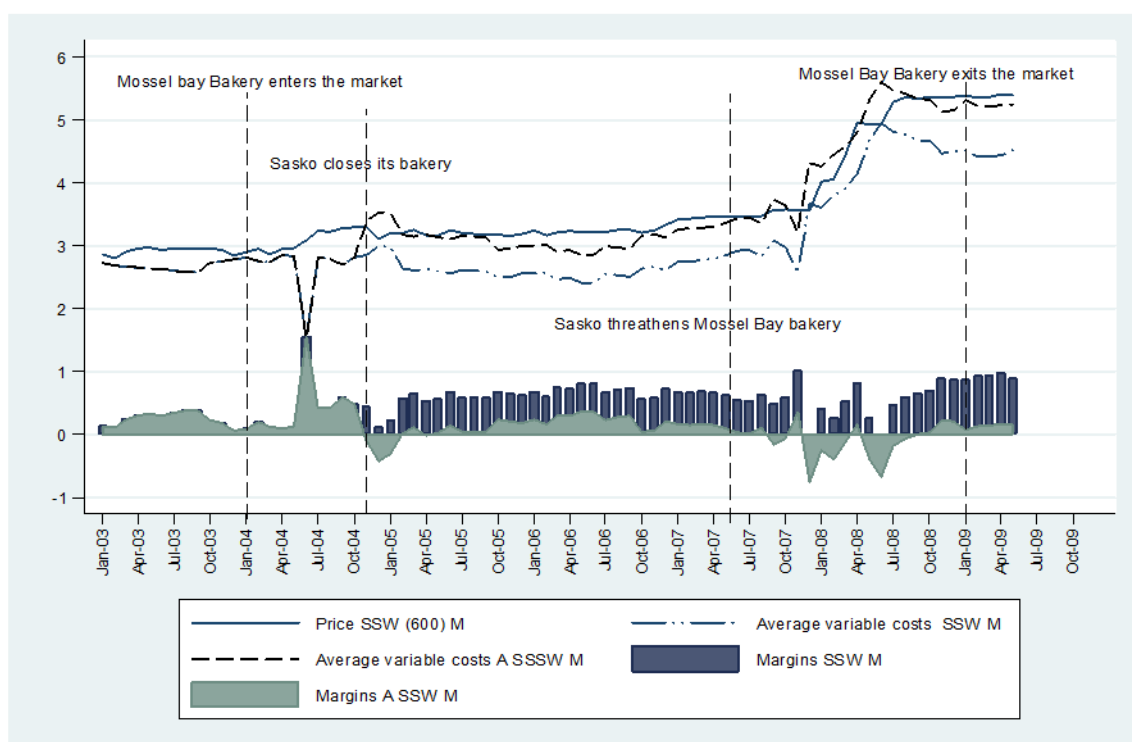
Figure 3-2: Sasko's Vita and Econo bread prices and AVC in Worcester, (Rands, 600g)



Source: own calculations

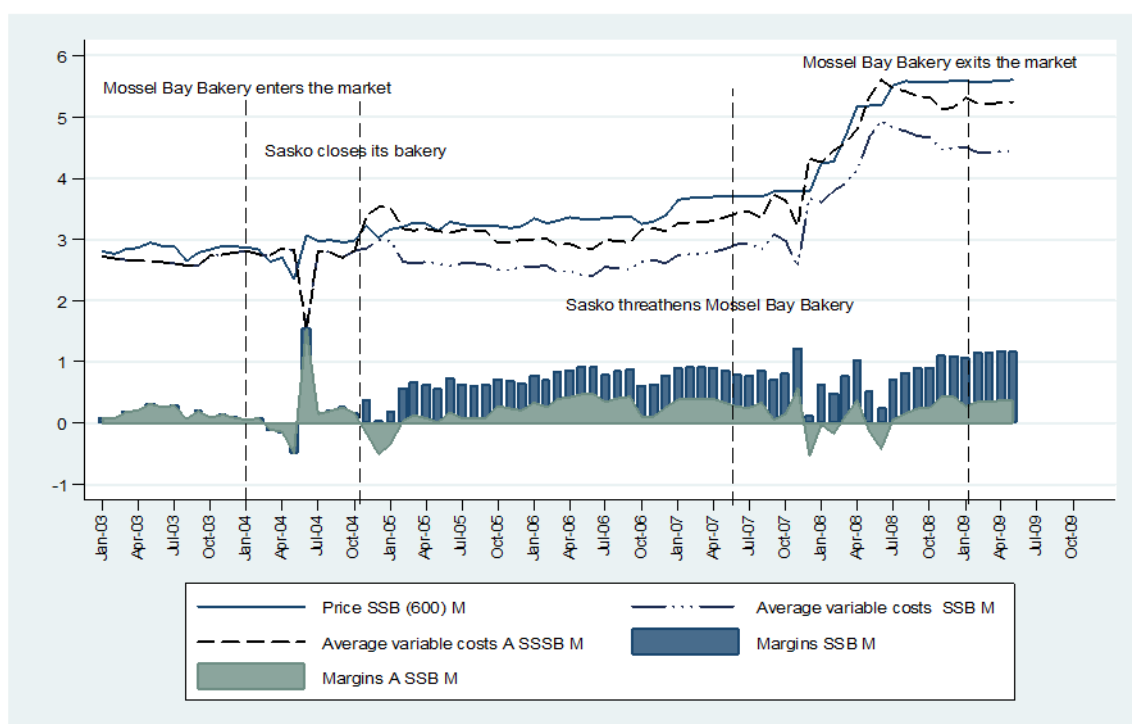
Figures 3-4 and 3-5 show Sasko sam white and brown bread prices and AVC in Mossel Bay for the period January 2003 to October 2009. Up until November 2004, Pioneer Foods had baked and sold bread in Mossel Bay. Pioneer Foods closed down its bakery in Mossel Bay in October 2004 and opened a distribution depot and transported bread to Mossel Bay baked from Pioneer Foods' Worcester bakery about 300 km's away. I represent AVC when regard is taken for transport costs from Worcester to Mossel Bay and local distribution costs. These transport costs are based on estimates from an independent bakery. The shaded margins represent Pioneer Foods' margins inclusive of the transport costs from Worcester to Mossel Bay and bars represent Pioneer Foods' margin assuming it baked bread in Mossel Bay. Figure 3-4 shows that Pioneer Foods's prices were below AVC from October 2004 to March 2005 and again from September 2007 to July 2008. Figure 3-5 shows that Pioneer Foods' prices were below cost from March 2004 to May 2004, November 2004 to January 2005, December 2007 to Feb 2008 and April 2008 to May 2008. Mossel Bay bakery exited the market in January 2009 and became Pioneer Foods' distributor in Mossel Bay.

Figure 3-3: Sasko Sam white bread prices and AVC in Mossel Bay, (Rands, 600g)



Source: own calculations

Figure 3-4: Sasko Sam brown bread prices and AVC in Mossel Bay, (Rands, 600g)



Source: own calculations

6. Conclusion

The story behind predatory pricing by a cartel is that a new entrant decides to enter and gain market share by undercutting the cartel pricing equilibrium. Either all firms together or a few alone respond by engaging in a price war until the new entrant relents and is either accommodated into the cartel or exits. Generally, in oligopoly industries raising prices (after a predatory price war) does not only require discouraging entry, but also requires discouraging competition from many competitors.

The question then becomes, is a cartel price war following new entry predatory? Or does that depend on whether its motivation is to encourage higher prices? To illustrate this observability problem, suppose entry is observed in the bread industry for which it is believed that entry barriers are relatively low. This is followed by a period in which prices below AVC are observed. However despite the aggressive welcome, the new firm does not exit. This leads to a period in which bread prices increase and thereafter they stabilise. At first glance, one may conclude that the period of price below AVC signalled the intent to promote exit which turned out to be unsuccessful. This analysis would therefore increase the probability of type II errors by allowing anticompetitive predatory pricing.

In contrast, another interpretation may be that for the bread cartel to effectively maintain cooperation under the threat of entry, given the low barriers in bread baking, it had to respond to entry by pricing below average variable cost. Below AVC pricing in response to entry which succeeds in inducing exit therefore is indicative of successful predation. Below AVC pricing whether successful or not also indicates predatory intent. However, below AVC pricing in response to entry which fails to induce exit may not be indicative of unsuccessful exit promotion but rather of successful collusion. By responding aggressively to entry, the cartel members are acting to deter future entry and by doing so are able to sustain a significant degree of cooperation in spite of the absence of substantial barriers.

The evidence on the price wars in several towns in the Western Cape province suggests that they were predatory in nature. Comparing AVC to prices to establish whether the conduct was anti-competitive, suggests indeed that a legal standard was violated. In both Worcester and Mossel Bay entrants were driven out of the market by predatory prices and after their exit prices increased substantially. This provides one essential element of a predation case, proving that losses can be recouped. Establishing predatory intent is an important part of the qualitative argument. Entrants quote a series of threats to use of predatory pricing. These threats were

deliberate and conscious attempt to force new entrants out of the market. There were also meetings on the formal terms under which an entrant could be admitted to the cartel and if entrants did not abide to the terms a price war would be declared. Pioneer Foods admitted to the strong evidence of predatory intent on the part of its managers. The timing of entry into the cartel, price wars and the price movements described are all consistent with the predation story.

Cartel investigations do not usually discuss whether the cartel engaged in activities to block entry because such evidence is not necessary for conviction, especially so where price fixing is *per se* illegal. But undermining barriers, especially those erected by cartelists is an important part of competition policy. Access to markets is actively limited by the cartels, using strategic behaviour such as predatory price wars. Cartels need to exclude entrants simply because firms who face numerous rivals are constrained in their incentive and ability to coordinate.

IV. ESSAY FOUR

DESIGNING APPROPRIATE REMEDIES AND THE PIONEER FOODS SETTLEMENT AGREEMENT

1. Introduction

The concluding of complex remedial schemes has brought the issue of appropriate remedies for competition law violations to the centre of the attention of competition law policy makers, enforcers, practitioners, and academics in South Africa. With Pioneer Foods admitting to its involvement in milled wheat and milled white maize (or milled white corn) cartels as well as engaging in general exclusionary conduct, there was little doubt as to the existence of most egregious offenses in competition law and the subsequent harm to consumers and competition. The main concern expressed related to the Commission's exercise of discretion in crafting appropriate remedies. With the uncovering of cartels in markets involving bread, flour, and white maize meal, this heightened the debate about appropriate remedies. White maize meal and bread are staple foods for most South African households, especially the poor. When the Commission concluded the settlement agreement, some argued that the Commission exceeded its authority when entering into the agreement with Pioneer Foods;¹²⁶ whilst others accepted the outcome as valid.¹²⁷

In its pursuit of innovative approaches to remedies, the Commission put itself in a difficult position of engineering remedies to achieve specific market outcomes.¹²⁸ The remedies that were confirmed by the Tribunal are a major measure of "success" in the enforcement of competition law in developing countries. They included, inter alia, a fine of R500 million, part of which by agreement was set aside for the creation of an Agro-processing Competitiveness Fund ("Agri-fund"), a commitment not to reduce capital expenditure as well as a commitment to reduce prices

¹²⁶ The National Treasury Department made an application to intervene in the Tribunal questioning the settlement agreement's validity and the Commission's authority to conclude it.

¹²⁷ Trade Unions, NGOs, and the National Department for Economic Development came in support of the Commission.

¹²⁸ For example, the Minister of the National Department for Economic Development pronounced proudly in the National Parliament that "[t]his settlement shows the resolve of the competition authorities to act swiftly and effectively to promote a competitive food-processing sector. . . . For this reason, both structural and behavioural measures are important to bring in new players along the value chain. The new, pro-active stance of the competition authorities, coupled with a strong investigative capacity, makes it harder for companies to escape with anti-competitive conduct." Statement by Ebrahim Patel, Minister of Econ. Development, to the National Assembly on the Competition Commission Investigation, at 7 (Nov. 2, 2010), available at <http://images.businessday.co.za/Pioneer.pdf>.

on the sale of selected flour and bread products over an agreed period. The creation of the Agri-fund was aimed at lowering the barriers to entry into the agro-processing industry, while the price reduction and capital expenditure commitments sought to constrain Pioneer Foods, compensate and disgorge some of its profits to the benefit of consumers, and improve the competitive dynamics of the relevant markets.¹²⁹

I focus on the discount remedy.¹³⁰ It is surprising that discount remedies, while permissible under competition law, are rarely used by competition authorities. More provocatively, given the very weak private and class damage suits in South Africa and the frequent ineffectiveness of behavioural and structural remedies, I argue that it is time for this enormously powerful but seldom used remedial tool to take centre stage as a competition law remedy. In order to make a relatively informed assessment of the impact of the discount remedy, I use two comparative approaches. First, I refer to the example of soaring food prices globally, not only to add a comparative perspective but also because South Africa is not immune to global increases in food prices. South Africa is a relatively small player in the world market, and wheat is internationally traded; commodity prices are subject to global price movements after taking account of transport costs. Generally, wheat prices are around import parity, reflecting the fact that South Africa is a net importer of wheat. Secondly, I evaluate prices and sales only in the market at issue, comparing prices (and sales) in the remedy period to available prices (and sales) before and after the period of impact.

The settlement agreement raises interesting questions. What is an appropriate and suitable remedy? Does the appropriateness test require a fit between the theory of harm and the type of remedy imposed? Is there a limit to the Commission's exercise of discretion in crafting remedies? All these important questions are discussed in section 2. Section 2 explores the design of the settlement, focusing on the relationship between the narratives of harm and the consequent choice of the remedies. Section 3 evaluates and provides some evidence of the effectiveness of the discount remedy. Section 4 concludes.

¹²⁹ Price reductions only applied to selected products the gross margins of which were high enough to avoid predatory outcomes.

¹³⁰ Time has been relatively short since the implementation of remedies in the Pioneer Foods settlement agreement to be able to proffer a well substantiated judgement on its success or failure. As such, we will not assess the impact of the capital expenditure remedy. However, we note that Pioneer Foods has not reduced its capital expenditure to date. In fact, it has committed to build a new biscuit factory. In general, we will not evaluate the deterrence effects of the settlement agreement on Pioneer Foods, although we make reference to fines and deterrence.

2. Designing appropriate remedies in the Pioneer Foods settlement

A. DISTRIBUTIVE JUSTICE

The pursuit of distributive justice is eminently permissible if not compelled by South African competition law and its unique responsiveness to issues of distributional equity and fairness. The Commission has several special mandates, among others, to promote efficiency, adaptability and development of the economy; to provide consumers with competitive prices and product choices; to promote employment and to advance the social and economic welfare; and to ensure that small and medium sized enterprises have an equitable opportunity to participate in the economy. The goal of South African competition law is not only to enhance total economic efficiency, in which case the pursuit of distributive justice would be by assumption a waste of resources. Competition law is, at least in part, concerned with avoiding wealth transfers from consumers to cartel firms. Competition law is not perceived in a narrow sense and has more than one final goal. By protecting the competitive process, the Commission furthers various goals of competition policy, including maximizing welfare as well as protecting market participants such as final consumers. Competition law has a distributive and protective function.¹³¹

In general terms, different remedial approaches are directed either by corrective or distributive forms of justice. Corrective justice is based on the notion that victims be put in the position they would have been but for the violation of their rights.¹³² Corrective justice is not concerned with the impact of the remedy on third parties and other interests. Distributive justice, on the other hand, is concerned with the distribution of shares of resources among members of a given group. It takes into consideration third party and other legitimate social interests that may be affected by a remedy.

Distributive justice allows competition authorities to appreciate the reality represented by the socioeconomic context. This context in South Africa is characterised by the widespread poverty and inequality. In the competition policy sphere, context is represented by anticompetitive outcomes in any given sector because of South Africa's history of regulated cartels, inherited monopolies, and high concentration levels. Traditionally, deterrence, pecuniary damages, compensation, disgorgement, and restitution have strong roots in the corrective justice philosophy. Their main objective in particular is to restore the position of the victim. In contrast, injunctive relief has a dual role by serving the objects of both corrective and distributive forms of

¹³¹ See Zimmer (2011).

¹³² See Modak-Truran (1991) and (2000).

justice. It can be argued that distributive justice sets the foundation against which the but-for world in corrective justice is measured. This suggests that corrective justice is the remedial arm of distributive justice. The pursuit of distributive justice through restoration of competition, compensation, and disgorgement is a legitimate task for competition law enforcement.

B. THE “APPROPRIATENESS” STANDARD

Section 49D(1) of the Competition Act provides that, if the Commission and a respondent “agree on the terms of an appropriate order,” the Tribunal may confirm the agreement as a consent order. An “appropriate” consent order is one which is “suitable,” that is, “suitable in the sense that it is an agreement that suits the contending interests of the Commission, as the proxy of the public interest, and the respondent, and in that sense, can be appropriate as between themselves.”¹³³ However, Section 58(1)(a) of the Competition Act does not provide an exhaustive list of the kinds of orders that the Tribunal may make. Whatever remedy imposed must be “appropriate.” The principle of appropriateness constitutes an important limit to the Commission’s discretion in imposing remedies.

The Tribunal is required to be satisfied when confirming a consent and settlement agreement. This means that remedies agreed by the Commission and a respondent do not exceed the limits of what is appropriate and suitable. In a sense, the appropriateness of a particular remedy differs from a cost-benefit analysis, which focuses only on the gravity of harm and the alternative remedies that might be imposed. The appropriateness and suitability character of remedies requires remedial measurement, not only with regard to the magnitude and scope of the harm to consumers and competition or the nature of the infringement, but also in relation to the type of violation that was identified. This would cover not only a particular competition law prohibited practice, but also the theory of harm advanced in the specific case. Remedies need to be effective in pursuit of their objectives. The principle of appropriateness requires a fit between the harm and the remedy. The Commission’s discretion in crafting remedies is very broad, allowing it to address various aims and objectives of the Competition Act subject of course to the appropriateness test. Essentially, the appropriateness test is an objective test and is thus justifiable.

¹³³ Order and Reasons, Competition Comm’n v. South African Airways (Competition Tribunal), Case No. 83/CR/Oct04 at ¶ 47 (Dec. 4, 2006) (S. Afr.), *available at* <http://www.icn-capetown.org.za/%5Ccomptrib%5Ccomptribdocs%5C577%5C83CROct04.pdf>.

C. THE NARRATIVES OF HARM

Cartels have pernicious effects on poor consumers despite the obstacles created by legal prohibitions on collusion and individual firm's incentives to compete rather than to collude. For South African consumers, bread and maize meal are staple foods, and flour is a major input of bread. The direct cost of cartels is plain: prices are high and there is reduced product choice (if there is customer allocation and/or if the cartelized product is differentiated). Until the 1990s, the marketing of agricultural products in South Africa, including grain products, was extensively regulated by the state through the Marketing Act of 1937 (consolidated in the Marketing Act of 1968).¹³⁴ After deregulation in 1996, while direct controls were removed, it appeared that extensive private anticompetitive arrangements replaced the public controls.

In December 2006, the Commission received information of an alleged bread cartel that was active in the Western Cape. The Commission initiated a complaint against Premier, Tiger Brands, Foodcorp, and Pioneer Foods, all of whom allegedly had been involved in the bread cartel. The four companies are the largest in many food product markets and are vertically integrated into flour and bread production. Premier applied for leniency in terms of the corporate leniency policy, during which it revealed that bread and milling cartels operated in parts of South Africa and admitted to its involvement. Premier's leniency application was corroborated by a further leniency application from Tiger Brands. Tiger Brands also admitted to its involvement. Subsequently, Foodcorp also admitted to its conduct and settled the bread case with the Commission.

After contested proceedings and on February 3, 2010, the Tribunal ruled that Pioneer Foods had engaged in fixing the price of bread products in the Western Cape province and nationally, imposing on Pioneer Foods a fine of R196 million. Following this, Pioneer Foods approached the Commission with the intention of settling all the other cases that had been referred to the Tribunal for adjudication or that were currently under investigation by the Commission in which it was a respondent. The following is a brief description of some of the markets damaged by Pioneer Foods' anticompetitive conduct that formed part of the settlement agreement.¹³⁵

¹³⁴ Marketing Act 37 of 1937.

¹³⁵ See Consent and Settlement Agreement Between the Competition Commission and Pioneer Foods (Pty) Ltd. in Regard to Contraventions of Sections of the Competition Act 89 of 1998, as Amended, Competition Comm'n v. Pioneer Foods (Pty) Ltd. (Competition Tribunal), Case No. 15/CR/Mar10 (Nov. 30, 2010) (S. Afr.), available at http://www.comptrib.co.za/cases/consent-order/retrieve_case/1218.

The Commission's investigation revealed that, at various stages from 1998 to at least 2007, Pioneer Foods and its competitors in the milled wheat and white maize markets (including Tiger Brands, Pioneer Foods, Foodcorp, and Premier) engaged in price-fixing arrangements in contravention of section 4(1)(b)(i) of the Competition Act. Pioneer Foods and its competitors had attended numerous meetings and had held telephone conversations in which they agreed at both national and regional levels *inter alia* to fix the price of milled white maize products and milled flour products, as well as to create uniform price lists for wholesale, retail, and general trade customers. They also agreed to the timing of the price increases and the implementation thereof. Through these price-fixing arrangements, Pioneer Foods and its competitors prevented and/or limited price competition amongst themselves. Pioneer Foods admitted that it contravened section 4(1)(b)(i) of the Competition Act with this conduct.

The Commission's investigation also revealed that Pioneer Foods engaged in predatory conduct. The Commission's investigation was pursuant to an initial complaint brought forward by Mossel Bay Bakery, an independent bakery. According to Mossel Bay Bakery, Pioneer Foods engaged in a predatory price conduct, charging prices for bread below cost with the intention of eliminating Mossel Bay Bakery from the market. The Commission's investigation revealed that Pioneer Foods was dominant in several local markets and that from 2002 to 2004 and in 2007, Pioneer Foods had indeed priced below cost. Pioneer Foods admitted to threatening competitors with predatory conduct in several towns within the Western Cape province and introducing fighting brands in order to protect its market share in areas where it was facing competition. These fighting brands were to be pulled out once a competitive threat had been removed. This conduct prevented small independent bakeries from competing effectively and allowed Pioneer Foods to build a reputation for fighting entry across markets and time. Pioneer Foods admitted that its conduct may have impeded small independent bakeries from expanding within the market and competing effectively, in contravention of section 8(c) of the Competition Act.

Following the uncovering of the cartels in bread and milling, the Commission also initiated an information exchange case involving the wheat milling members of the National Chamber of Milling ("NCM") and the South African Chamber of Baking ("SACB"). The Commission was concerned that it was not observing competitive outcomes even after having uncovered cartels in the industry. The Commission's investigation revealed that the respondents, which included Pioneer Foods, submitted to and received commercially sensitive information from the SACB and NCM. This investigation is at the time of writing (December 2013) on-going, but the respondents have agreed to cease the conduct pending the outcome of the investigation.

D. THE CONSEQUENT CHOICE OF THE REMEDIAL APPROACH

The Pioneer Foods settlement agreement had, among others, the purpose of enhancing and restoring competition in the relevant markets. The agreement sought to promote competition in pursuit of the objectives and purposes of the Act. Pioneer Foods undertook in terms of the proposed settlement agreement to the following. First, it would desist from the conduct that infringed or might infringe the Act, continue its compliance program to prevent future infringements, and cooperate with the Commission in its prosecution of others. Second, it would pay a fine of R500 million to the National Revenue Fund. In addition, the Commission, the National Treasury, and the Economic Development Department separately agreed that the Economic Development Department would submit a budgetary proposal and business case motivating for the creation of an Agro-processing Competitiveness Fund of R250 million drawn from the penalty and to be administered by the Industrial Development Corporation (“IDC”). Third, it would reduce the prices of certain of its products for an agreed period of time up to the total value of R160 million. Fourth, it would maintain its capital expenditure budget and just increase it by R150 million.

The settlement agreement excluded an earlier fine of about R196 million in relation to Pioneer Foods’ involvement in the bread cartel. The fine of R500 million amounted to about 5.6 per cent of the turnover of Pioneer Foods’ subsidiary Sasko in 2009. The fine was in essence in relation to Pioneer Foods’ admitted involvement in the white maize meal and milled wheat products cartels. In respect of the exclusionary conduct case, Pioneer Foods admitted to the conduct as being in contravention of section 8(c), for which there would be no penalty for a first contravention. Pioneer Foods’ admitted to anticompetitive conduct involving products affecting all South Africans and especially the poor, for whom bread and maize meal are staple products. The effect of the conduct was inherently harmful to consumer welfare.

Pioneer Foods’ conduct also affected the structure of the relevant markets. This conduct, coupled with the legacy of the previous regime with its state-sanctioned cartels, created an environment that did not encourage or facilitate entry. The Commission regarded it as its mandate, not just to address the cartel conduct through punishment and deterrence, but also to address the structure of these markets through the Agri-fund. The Agri-fund is aimed at facilitating new entry into the value chain in the agro-processing industry, specifically by small to medium enterprises that are also the domain of historically disadvantaged South Africans.

Although the bread baking industry in South Africa is characterized by low exogenous barriers to entry, the existence of the cartel in flour mitigated the ability of independent bakers to enter and expand within the industry. Premier, Tiger Brands, Pioneer Foods, and Foodcorp together account for more than 95 per cent of the milled flour market; at the same time, they collectively dominate the downstream bread market. A cartel facilitates entry by keeping prices high. In the case of cartel firms in bread supply, predation was collective.¹³⁶ Predatory pricing conduct was used to create artificial barriers to entry. South African consumers were faced with a vertically integrated monopoly. The settlement agreement set out to undermine the anticompetitive environment created by the cartels by reducing the barriers to entry. It aimed to introduce competition and instability into historically stable markets, to the benefit of consumers.

The pricing reduction remedy was intended to not only compensate consumers but also to undermine the effects of Pioneer Foods' admitted anticompetitive conduct on prices in the relevant markets. Prices of flour, maize meal, and bread products went up as a result of collusion and strategic behaviour and have been sticky downwards following the uncovering of this anticompetitive behaviour, particularly with regards to bread prices (as Figure 4-2 demonstrates). Through the price reduction commitment, the Commission sought to achieve a direct benefit to consumers as well as to stimulate more intense rivalry in the market. The price reduction commitment was designed to stimulate rivalry while at the same time enabling smaller non-vertically integrated participants in bread. To avoid unintended predatory outcomes, the price reductions were targeted at those products with sufficiently high gross margins.

The commitment to increase approved capital expenditure by an additional amount of R150 million was aimed at increasing Pioneer Foods' output for certain product lines as well as contributing to the creation of jobs. The Commission was concerned about the impact of the settlement agreement, in the context of the economic recession, that Pioneer Foods might use it to justify job losses and reduced output.

3. A critical assessment of the effectiveness of the Pioneer Foods remedies

In this part, I focus on evaluating the impact of the price reduction remedy. Consumers were harmed by the conduct of Pioneer Foods and others. To partially compensate consumers for their injury, Pioneer Foods committed to reduce its prices of selected standard bread and flour products for a limited period of time up to the value of R160 million. I demonstrate using a simple

¹³⁶ While the Commission pursued predation allegations only on Pioneer Foods in the Western Cape province, there were allegations of similar conduct by other cartel firms in other regions.

framework that such discount remedies result in a deadweight loss by inducing excessive consumption by consumers; however, I do not compare the magnitude of the loss to that caused by the cartels. I demonstrate the impact of the discount remedy on prices and sales before and after the remedy. But first, I discuss the impact of settlement programs and fines on deterrence.

A. SETTLEMENT PROGRAMS

Settlement programs generate clear and significant benefits. First, they reduce legal costs for both the competition authorities and respondent firms. They allow for speedy resolution of disputes outside the formal litigation route, but their outcomes have a force of law. The added benefit for consumers is that the conduct will cease earlier than would be the case if the respondent firm defended the matter while continuing the conduct. For the respondent firm, the added benefit is to put the matter behind it and focus on running the business. Competition law transgressions consume a lot of management time and attract bad publicity. For settlement programs to work, all parties must see the benefits. It is for this reason that administrative penalties in settlements should generally be lower than the fines that the case would attract if it was litigated. In other words, the firms must know that if they do not settle, they are likely to be successfully prosecuted and fined heavily. Settlements therefore reduce the expected penalty paid by competition law violators. However, the presence of litigation costs suggests that it is worth settling even if the penalty is not lowered.

Pioneer Foods could have been fined at least up to 10 per cent of turnover for its involvement in each of the two cartels in which it admitted involvement (the white maize milling cartel and the wheat milling cartel). In other words, Pioneer Foods would not have settled unless the settlement payment was less than the expected cost of pursuing the Commission's referrals through adjudication, trial, and appeal. Such outcomes lead to reduced deterrence. Polinsky and Rubinfeld (1989) offer one illustration of this point, using a model in which the injuring party settles only if the settlement leads to a reduction in the expected penalty plus the expected cost of litigation. While an exact balancing of the costs and benefits of a settlement program is undoubtedly difficult, settlement programs do generate improved deterrence within the constrained, limited enforcement budget, as is the case in South Africa. A settlement program communicates to others the benefit of settling early rather than at a later stage. The need for speedy resolution has implications for the costs of litigation. In this case, Pioneer Foods only came forward with a settlement proposal after having been fined for its involvement in the bread cartel and four years after being made aware of the Commission's investigation.

B. FINES AND DETERRENCE

The literature on fines points out that fines deter cartel violations in a number of ways.¹³⁷ First, fines may have a deterrent effect, by creating a credible threat of being prosecuted and punished. This raises the expected costs of a cartel above the expected benefits. Second, fines may have a moral effect, in that they send a message to the spontaneously law-abiding, reinforcing their moral commitment to the competition law prohibitions.¹³⁸ In addition, fines have disgorgement of the unjust profits as one of their effects in that the proceeds of fines normally go to into the public budget rather than to the victims of the cartel violations. It could be argued also that fines contribute to the pursuit of distributive justice through compensation in an abstract and indirect way, of course, if one assumes that the restoration of competition will benefit the general public.

Fines are usually much lower than the collusive gains and in many cases do not represent a credible threat to deter collusion. Connor and Lande (2007) compared the fine levels imposed by the European Commission and the U.S. authorities to the amounts gained on average by cartels as a result of their offense.¹³⁹ They collected and analyzed the available information concerning the size of the overcharges caused by hardcore price fixing, bid-rigging, and market allocation agreements. They found that cartels over-charged on average between 18 per cent and 37 per cent in the United States and between 28 per cent and 54 per cent in the European Union.¹⁴⁰ Connor (2006)'s analysis of EU cartel decisions from 1998 to 2004 likewise concludes that deterrence is not being served, in that "fines imposed by the EC Commission are not based on estimates of the offender's gain or victim's losses . . . the (EC) Commission makes no attempt to estimate the overcharge or to concede that it is possible to do so. As a result . . . it would seem doubtful that fines, even at their present historically high levels, deter price fixers."¹⁴¹

Deterrence through the use of fines will work if, and only if, from the perspective of the company contemplating whether or not to commit a violation, the expected fine exceeds the expected gain from the violation.¹⁴² This assumes, as Jenny (2009) points out, that persons engaging in illegal

¹³⁷ Concerns about the inadequacy of fines are the object of an intense debate within the competition policy circles. See Harrington (2004); OECD (2003); and Motta (2008).

¹³⁸ See Wils (2006).

¹³⁹ See Connor and Lande (2007).

¹⁴⁰ Connor and Lande (2005) conclude that average cartel overcharges in the United States are between 15 percent and 36 percent, with most of the median and average results between 20 percent and 30 percent. They recommend that the Sentencing Commission raise the current level of cartel penalties.

¹⁴¹ See Connor (2006).

¹⁴² See Wils (2006).

practices are rational individuals who consider the expected cost and benefit to them of violating a law and will engage in such a violation if it pays.¹⁴³

The Tribunal has established that the primary role of fines in South Africa is deterrence rather than retribution.¹⁴⁴ However, the current situation in South Africa is that fines are the only sanction used to deter cartel violations and are not combined with fines on individuals, imprisonment, or other individual sanctions or with private damages. Moreover, private enforcement of competition law is weak. Under-deterrence arises from generous discounts and weak private anti-cartel enforcement. Aproskie and Goga (2011) examined two popular claims that fines are passed on to consumers and that high fines could lead to poor competitive outcomes such as firms exiting the market. They conclude that administrative penalties do not lead to higher prices for consumers; fines do not generally impact the optimum pricing levels of a firm and that only in very specific circumstances would a fine lead to firm closure.

From a deterrence point of view, Jenny (2009) rightly observes that “it makes no difference whether payments are made to the state budget or to consumers. Thus the current discussion in the EU on private enforcement should take into account the fact that even if the purpose of private enforcement is to compensate victims rather than to punish violators, the possibility of adding compensatory damages to administrative (or criminal) sanctions increases the overall cost of being caught for violators and therefore increases the deterrent effect of the enforcement system. This means that when considering whether an enforcement system is over deterrent or under deterrent (and when considering whether more or less resources should be devoted to public enforcement), one should take into account the effect of the interaction between public and private enforcement.”

The administrative penalty imposed on Pioneer Foods as a result of the settlement was 8.9 per cent of Pioneer Foods’ grain business turnover.¹⁴⁵ In monetary terms, the administrative penalty was the highest ever levelled on a firm in South Africa. I must assume that Pioneer Foods did not just want to put the matter behind it, but thought the likelihood of getting higher penalties at the Tribunal was higher. This conclusion would not have been unreasonable. Should the Tribunal have levelled a maximum fine on the total turnover of Pioneer Foods for each of the contraventions, the penalty could have been over one billion rands. While fines must be set at levels that effectively deter anticompetitive behaviour, such a calculation is difficult. In Europe,

¹⁴³ See Jenny (2009).

¹⁴⁴ Administrative Penalty and Reasons for the Competition Tribunal’s Decision, Competition Comm’n v. Fed. Mogul Aftermarket Southern Africa (Pty) Ltd. and Others (Competition Tribunal), Case No. 08/CR/Mar01 (Jan. 28, 2003) (S. Afr.), available at <http://www.comptrib.co.za/assets/Uploads/Case-Documents/08CRMar01.pdf>.

¹⁴⁵ The penalty includes the fine of R500 million and the price reduction commitment of R160 million.

the cap is 10 per cent of the group's (not the firm's) worldwide turnover, and still there are repeat offenders.¹⁴⁶ It is important to also note that the South African jurisdiction is relatively new and immature when it comes to fining. The majority of fines are imposed by way of settlements, and the courts have not had many opportunities to decide on the matter, and there are no fining guidelines. It is therefore extremely difficult to assess the effect of fines on deterrence at this stage.

C. THE DISCOUNT REMEDY

To my knowledge, a pure discount remedy as contemplated in the Pioneer Foods price reduction commitment has not been used in South Africa or elsewhere, although coupon remedies have been widely used in the United States. For example, in 1994, passengers who had travelled on major U.S. airlines between January 1988 and June 1992 received coupons with a total face value of approximately \$400 million.¹⁴⁷ The coupon could be applied toward their cost of subsequent flights, expired after three years, and could be transferred only to immediate family members or to someone designated in advance.¹⁴⁸

I. *A Simple Analytical Framework*

The Pioneer Foods price reduction commitment remedy was essentially a pure discount remedy. It involved a discount off the competitive price for all consumers of the product. Suppose the cost of producing the good is assumed to be constant per unit, with no fixed costs. During the cartel period, a firm charges the monopoly price. Assume for simplicity that, after the cartel period has been stopped, the non-collusive price is the competitive price, aside from the effect of any remedy. This might be the case because the price that would be paid in the absence of a discount is set by competitive firms who are not subject to any remedy. The consumption decision for a consumer in the cartel period is shown in Figure 1.¹⁴⁹

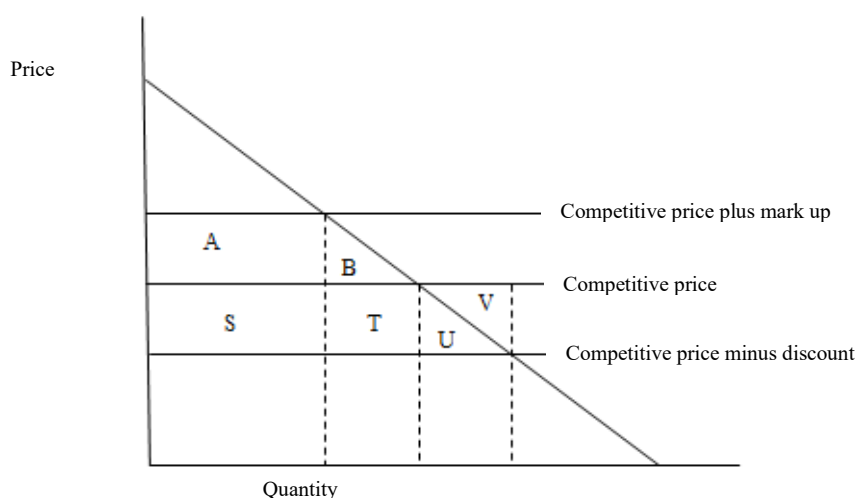
¹⁴⁶ See Massimo Motta, *Recent CAC Judgement Opens Door to Leniency on Cartels*, BUS. REPORT, Aug. 31, 2011.

¹⁴⁷ See Polinsky and Rubinfeld (2008).

¹⁴⁸ Similarly in 1994, Circa Pharmaceuticals settled a class-action price-fixing suit by issuing \$2.5 million in coupons that permitted former customers to purchase Circa products at a discount.

¹⁴⁹ See Polinsky and Rubinfeld (2008), modelling the deadweight loss from coupon remedies.

Figure 4-1: The consumption decision for a consumer in a cartel period



The loss of consumer surplus due to the price mark-up is the sum of the areas A and B. The value of the discount remedy to this individual is the sum of the areas S, T, and U. The discount is less than the mark-up in the cartel period. This follows from the observation that consumers buy more of the good at the discounted price than they did at the marked-up price. Consequently, if the discount equalled the mark-up, consumers would gain more from the discount than the loss from the mark-up. This is easy to see in Figure 4-1. The gain from the discount is the sum of the areas S, T, and U. The harm from the mark-up is the sum of the areas A and B. If the discount were to equal mark-up, then S and A would be of identical size, and T would exceed B; thus, the gain would exceed the loss. To avoid overcompensating consumers, the discount must be less than the mark-up. The deadweight loss of the discount remedy is shown in Figure 1 as the loss corresponding to area V (see also Appendix 1A for a technical derivation of this result).

Borenstein (1996) argued that firms will offset discounts by increasing the retail price from which the discount is calculated. The incentive for firms to respond by raising the retail price depends on whether the firm views the total loss under a discount remedy to be a sunk cost or believes that its behaviour can reduce that loss. However, the design of the discount remedy could eliminate such strategic behaviour. For instance, if the discount remedy has a binding time limit, specifying that discount will continue until a certain date in the future, then the total forgone profits from the contract are not fixed, and the firm will change its prices strategically in order to minimize the loss. If discount is dollar-limited, continuing until a given total discount amount is reached, then the firm is likely to treat the discount remedy as a sunk cost.

The extent to which free riding occurs among buyers and sellers also affects the response to the discount contract. As Borenstein (1996) rightly observes, even if a discount contract is dollar limited, the forgone profits for any one firm will not be fixed if the dollar discount is pooled across many defendants. Pooling of discounts across firms affects the incentive of any one firm to respond to a discount contract by adjusting its retail price. The incentives of sellers to adjust prices and the profits that sellers would forgo are also affected by the pooling of the total discount settlement among buyers. Competition in the market place will also prevent any one firm from responding to a discount remedy by raising their prices. If I assume that firms are engaged in repeated Bertrand competition, the static Nash equilibrium involves marginal cost pricing. If, however, the discount remedy is time limited, it can yield lower net benefits for consumers when applied to more competitive markets.

With the Pioneer Foods discount remedy, rival firms did not know the duration and extent of the reductions. However, the total value of the discount remedy was known. In an environment where markets had been stable as a result of collusion and information exchange, this lack of transparency introduces rivalry.

II. Implementation mechanism

The discount remedy implementation mechanism was designed in such a way that the average realized gross profit for the selected products over the base period would be compared with the average realized profit over the comparative period. The base period was chosen arbitrarily and did not correspond to the cartel period. The comparative period was defined as the period under review during the implementation of the discount remedy. The discount remedy amounted to a gross profit reduction of R160 million when compared with the base period.

Minimum levels of price reductions were set for each identified product category to ensure that the reductions had a meaningful effect for consumers. The stipulated minimum levels related to national averages over the comparative period per specified product category. A minimum price reduction of R350 per tonne on white bread flour, brown bread flour, and cake flour were set. For selected 600g and 700g white and brown bread categories, a minimum price reduction of 30 cents per loaf were set.¹⁵⁰ A further stipulation was included to mitigate the likelihood of any predatory outcomes as a result of reductions in bread prices. Pioneer Foods was not allowed to reduce prices

¹⁵⁰ See Media Release, Competition Commission, Pioneer Implements Agreement with Competition Commission to Reduce the Price of Selected Bread and Flour Products (Dec. 14, 2010), *available at* <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Pioneer-media-release-14Dec10.pdf>.

for those products whose gross profits were narrow. While the total value of the discount remedy was known to rivals, the duration and the minimum thresholds were not. Thus, the discount remedy was designed such that it was flexible, created uncertainty, and was not transparent to rivals. Furthermore, the Commission committed to monitoring compliance on the part of Pioneer Foods as well as monitoring the pass-through on the part of major retailers; however, monitoring the discount remedy requires resources.

III. Methodology

The methodology chosen is that of the “but-for” world, given by what the economic outcome would have been but for the Pioneer Foods settlement.¹⁵¹ I measure the actual prices (or sales) during the discount remedy period and compare these to the pre- and post-discount remedy period prices (or sales), or to the global developments in prices. I reinterpret the before-and-after approach in a regression framework, in which I estimate the price (sales) over the entire period for which data is available on a dummy variable equal to one when the price (sales) corresponds to the period when there was a discount remedy. The parameter associated with this dummy variable measures the amount of the price decrease (or sales increase) during the discount remedy. I assume a constant price differential through the impact period (as suggested by the coefficient on the dummy variable). Further, I extend the regression framework to include control variables that I believe affect the prices regardless of whether there has been a discount remedy. These include relevant economic variables that changed during the period of observation.

The model is expressed in its implicit form as:

$$\ln(\text{wholesale bread price}) = \beta_0 + \beta_1 \ln(\text{flour price}) + \beta_2 \ln(\text{maize meal price}) + \beta_3(\text{discount remedy dummy}) + \varepsilon \quad (6)$$

I do not include the quantity variable itself as an independent variable but instrument quantity by using the price of substitutes (maize meal prices). This is done to avoid the inter-dependence of price and demand.¹⁵² The cost and demand-shifters included are assumed to be exogenous, since they are presumed to be determined independently of price and therefore unaffected by price. The error term reflects random shifts in demand, cost, or conduct by the market participants. In

¹⁵¹ This approach is largely empirical, and it does not require making specific economic assumptions about the market.

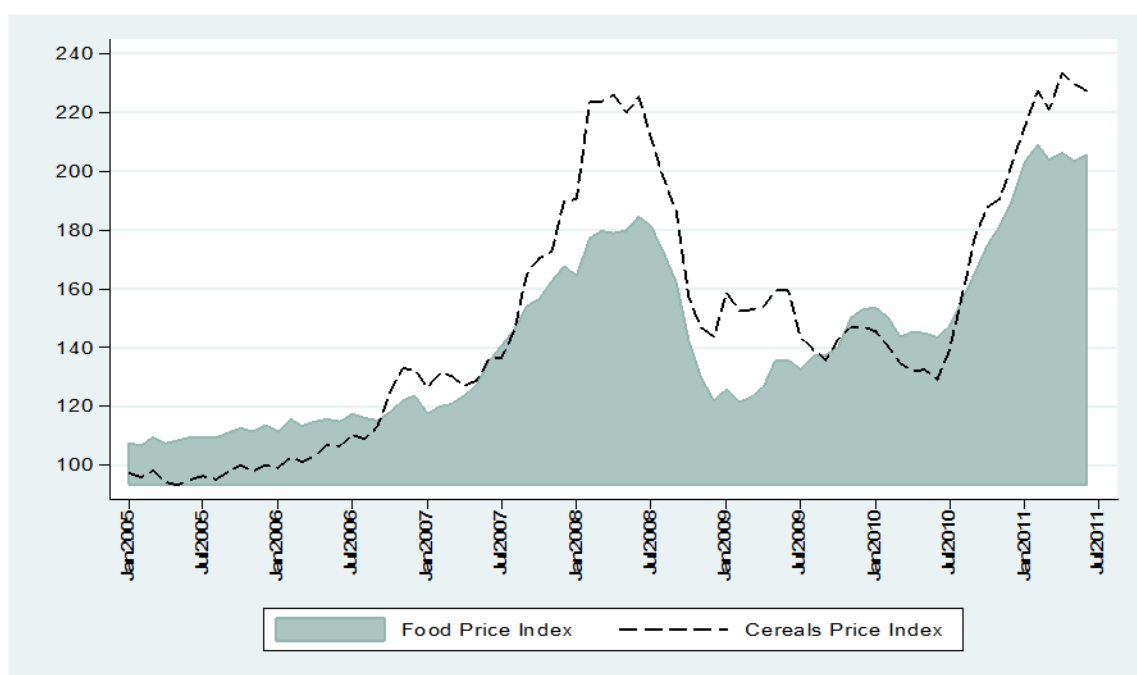
¹⁵² From an econometric perspective, ignoring the interdependence can cause serious consequences in the form of biased coefficients.

addition, there are demand and cost shifters which are only observable to the firms. These unobservable characteristics will be captured by the error term in the empirical model.

IV. Results

In thinking about the impact of this discount remedy, it is worth discussing first global developments in food prices. In 2010, international wheat pricing came under upward pressure because of the poor crop forecasts from Russia and Russia's subsequent banning of wheat exports until at least December 31, 2010. The strength of the rand and the new import tariff on wheat resulted in a steady increase in local wheat prices. Between April 2010 and October 2010, the Safex price of wheat increased by almost 22 per cent. These factors contributed to increases in food prices and had an impact on the discount remedy. During the impact period, global food prices were at their highest since 1990, according to the United Nations Food and Agriculture Organization (FOA), and the food price index recorded above the 200 mark for the first quarter of 2011, as Figure 4-2 shows. During the same period, the cereal price index overshot the food price index.

Figure 4-2: FAO food price index and FAO cereal price index, 2005-2011

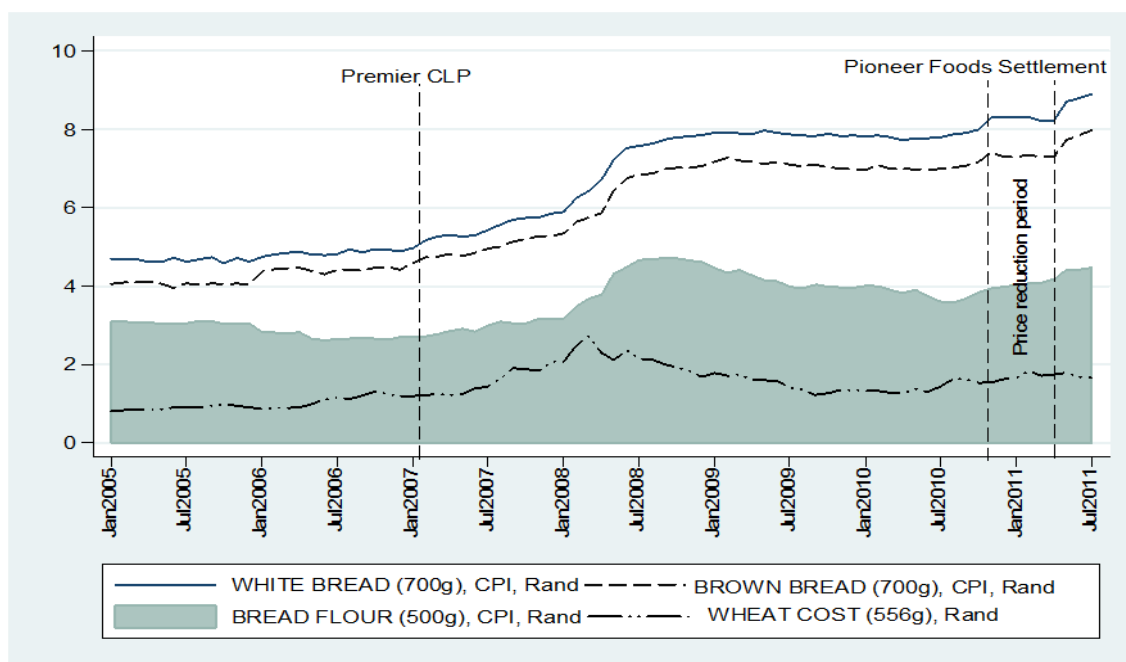


Source: FAO Food Price Index, United Nations Food & Agriculture Organization. Available at <http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/>

Notes: All indices have been deflated using the World Bank manufactures unit value index (MUV) rebased from 1990=100 to 2002–2004=100. The food price index consists of the average of 5 commodity group price indices weighted with the average export shares of each of the groups in the period from 2002 to 2004, while the cereals price index is compiled using the grains and rice price indices weighted by their average trade share from 2002 to 2004.

Pricing data from Statistics South Africa indicates that the price reductions made by Pioneer Foods translated into cheaper bread prices for end consumers. In light of the increasing global inflationary pressures on food prices and South Africa's position as a net importer of wheat, during the impact period, it appears that the discount remedy yielded positive results for consumers. Importantly, South African bread prices have been historically sticky downwards, as Figure 4-3 shows.¹⁵³ However, during the impact period, the national price of brown bread decreased by around 11 cents per loaf and stabilized at a lower level of around R7.30 per loaf (nominal consumer price index, from November 2010 to March 2011), while the national price of white bread was stable at around R8.31 per loaf from November 2010 to February 2011 and falling to around R8.22 per loaf in March 2011. Interestingly, the national average price of both brown and white bread (700g) increased by about 70 cents post the impact period. Pioneer Foods and its rivals knew that the discount remedy was for a defined period of time, and so they either could ignore the price reductions if they thought they would not have a long-term effect on their market shares or they could retaliate by lowering their prices in the hope that they would recoup their lost margins when the discount remedy was over. This is probably one explanation for the huge increases after the event.

Figure 4-3: National bread and flour prices

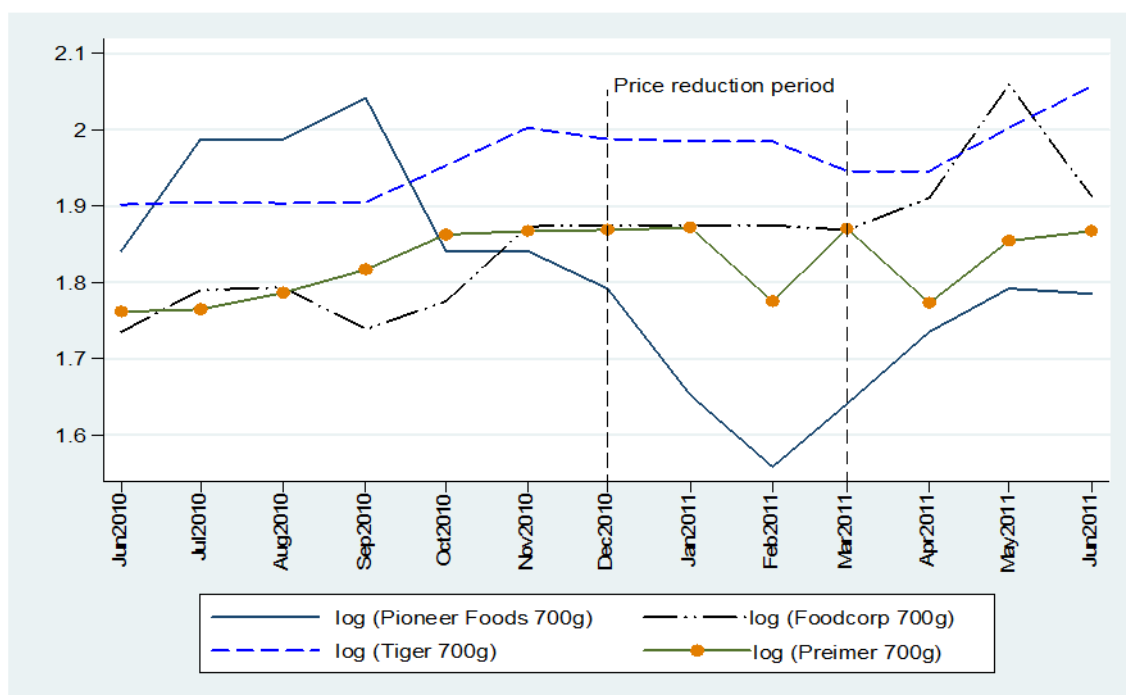


Source: Statistics South Africa, SAFEX. Food Price for the Period, South African Grain Information Service and own calculations

¹⁵³ For instance, the manager of Pioneer Food's subsidiary division, Sasko, indicated in testimony to the Tribunal as part of the bread cartel hearings that bread prices were never reduced when input costs declined because consumers apparently did not appreciate fluctuations in bread prices.

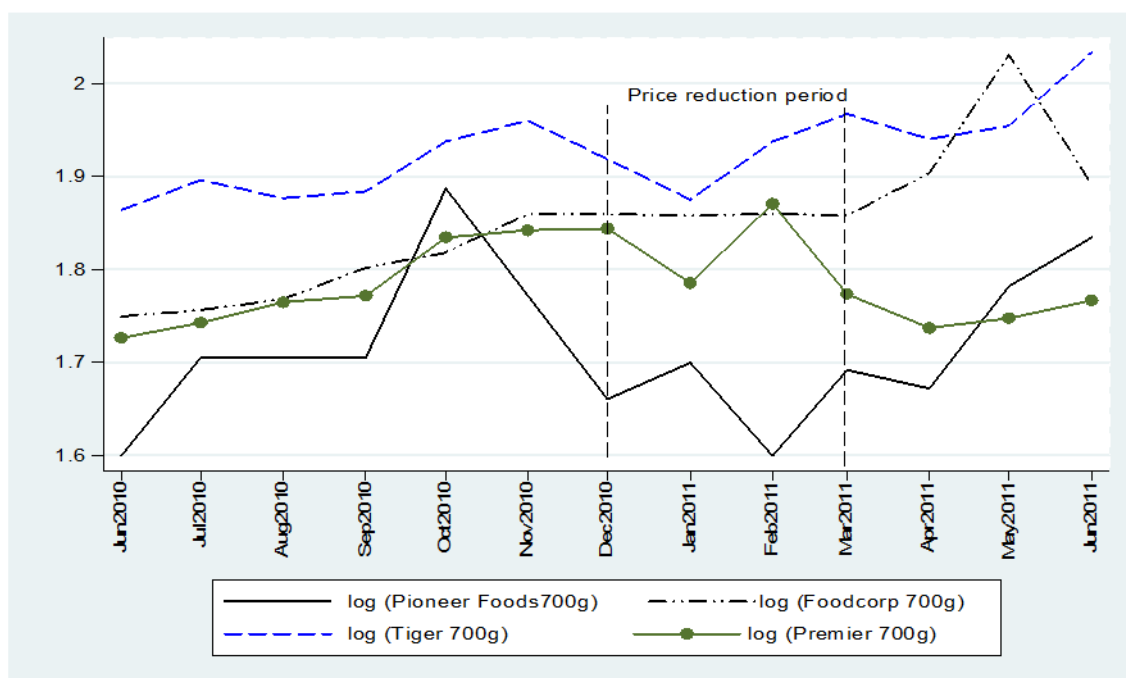
Next, I turn to the results of the comparison of pre- and post-impact period prices and sales with the actual impact period prices and sales to assess the price decrease. Pricing data from selected retailers in relation to bread products purchased from the major bread producers, namely Pioneer Foods, Premier, Foodcorp, and Tiger Brands, show the extent of the discount remedy.

Figure 4-4: Average wholesale price from producers to retailers, white bread 700g



Source: Selected retail outlets (Inland markets). and own calculations

Figure 4-5: Average wholesale price from producers to retailers, brown bread 700g



Source: Selected retail outlets (Inland markets) and own calculations

Figures 4-4 and 4-5 provide an indication of the impact of the discount remedy on the wholesale price of standard 700g bread loafs. The results show that, during the impact period, average wholesale prices of white and brown 700g bread decreased. Competition in the market prevented any one firm from raising prices, even as input costs rose. It appears also that competition in the market induced responses from Pioneer Foods' competitors, resulting in even wider gains for consumers than Pioneer Foods' own pricing commitment.

Pre- and post-remedy prices are reasonable approximations for the prices but for the remedy. To the extent that the remedy period prices differ in a statistically significant way from the pre- and post-remedy prices, I attribute a more or less reasonable degree of confidence in the price decrease. Table 4-1 shows the results from the regression analysis. In summary, the dependent variable in model 1 is the average wholesale price of bread charged by the bread producers, and the exogenous covariates include: (1) the wheat costs and flour costs (cost factors) and (2) maize meal prices (demand factors). For brown bread, the dummy variable is negative, and the estimated price reduction of 41 cents is statistically significant. While the dummy variable for brown bread is negative, as expected, the estimated price reduction of 27 cents is statistically insignificant. This may reflect consumer preferences for white bread and that bread producers introduced more discounts on brown bread than they did on white bread.

Table 4-1: Results from the regression analysis

	Brown Bread	White Bread
	<i>Dummy variable</i>	<i>Dummy variable</i>
Model 1 (Average Wholesale Price)	-0.418***	-0.269
- Cost factors (wheat and flour costs)	(-0.154)	(-0.214)
- Demand factors (maize meal prices)		
Model 2 (log Average Sales)	0.011*	0.266
	(0.105)	(0.146)

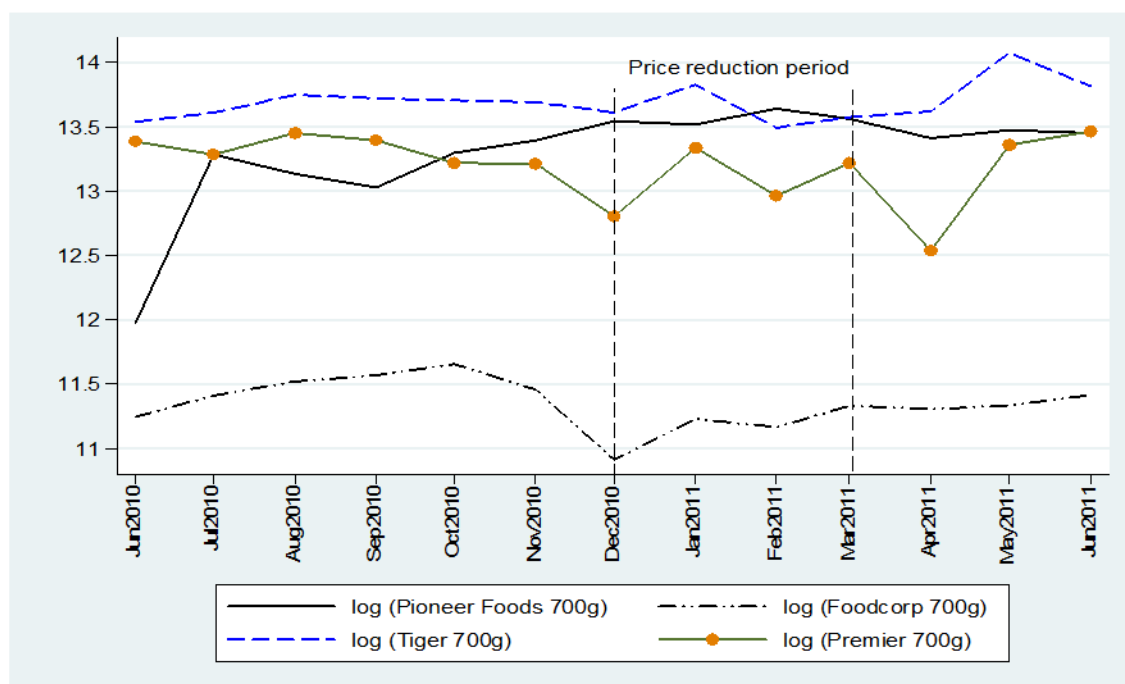
Notes: The table presents estimates of impact of the discount remedy and standard deviation (in parentheses). *** Indicates significant at the 1% level; * indicates significant at the 10% level.

Now consider the possibility of a consumption inefficiency created by the discount remedy. For example, if the cartel period resulted in the prices being set above the competitive prices for some period of time, during the remedy period, the price is discounted to some price below the competitive price for a period of time. If a particular consumer's demand was "high" in the cartel period, and that consumer's demand was "low" in the remedy period, that consumer will be induced to buy a socially excessive amount of the good during the remedy period. But if that consumer's demand is high again in the remedy period, there will not be a distortion. This is

because if a consumer's demand remains high during the remedy period, the consumer will purchase more of the good at the competitive price than he did during the cartel period, resulting in Pioneer Foods quickly reaching the target value of \$20.2 million (or R160 million). Consequently, all marginal purchases during the remedy period will be at the competitive price.

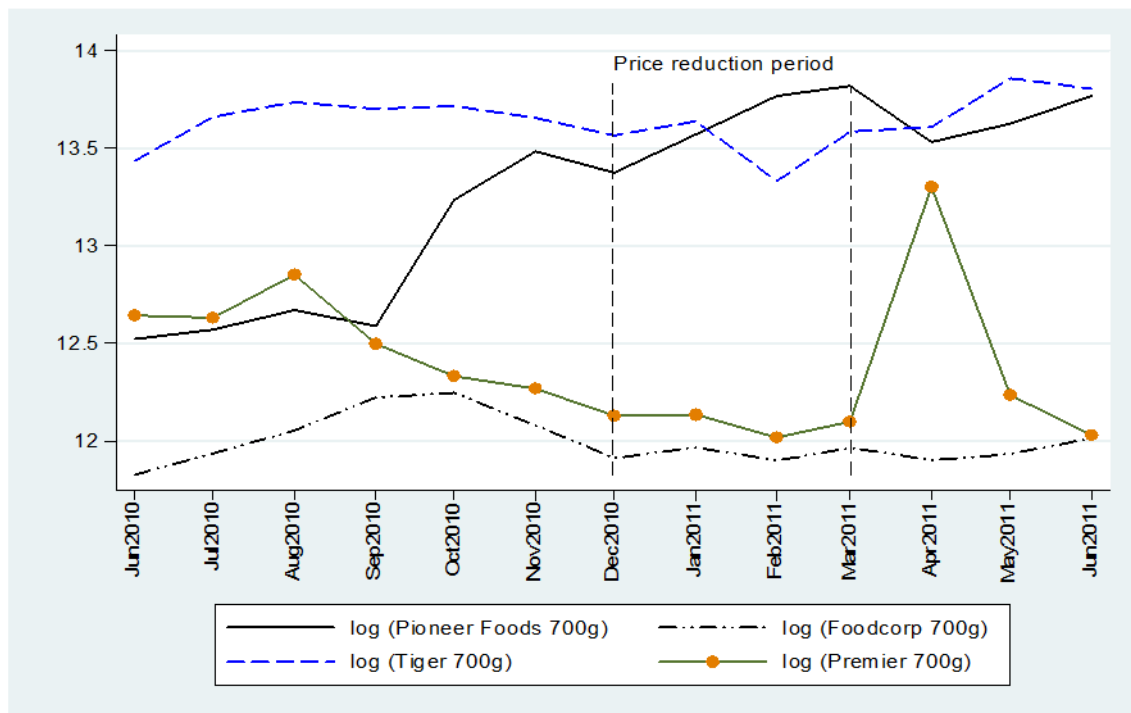
Figures 4-6 and 4-7 show the average wholesale purchases of standard bread by retailers from producers. Figure 6 does not appear to suggest strong distortions in consumption patterns for brown bread. This could be because the amount of discount was too low to induce customers to buy a socially excessive amount of goods during the impact period. Alternatively, the demand for bread, being a staple and perishable good, remained high before and after the discount remedy. Regression results in Table 4-1 show that the coefficient on the dummy variable for brown bread is significant and positive. This suggests that sales of brown bread rose by 1 per cent during the remedy period. Figure 4-7 shows an increase in demand for Pioneer Foods' white bread during the remedy period. However, the coefficient on the dummy variable for white bread, while positive, is insignificant (as Table 4-1 shows).

Figure 4-6: Average wholesale purchases from producers to retailers, brown bread 700g



Source: Selected retail outlets (Inland markets) and own calculations

Figure 4-7. Average wholesale purchases from producers to retailers, white bread 700g



Source: Selected retail outlets (Inland markets) and own calculations

According to Samantha Enslin-Payne, Pioneer Foods reportedly, following the implementation of the agreement, increased its volume growth at the expense of competitors.¹⁵⁴ Competitors such as Tiger Brands publicly acknowledged that trading volumes had been negatively impacted, particularly in flour, as a result of the highly competitive trading environment. An article by the *Business Report* in February noted how Tiger Brands' Albany bread was losing market share to Pioneer Foods' Sasko bread.¹⁵⁵

4. Conclusion

Corrective justice demands that victims be put in the position they would have held but for the violation of their rights. On the other hand, distributive justice is based on recognition of the constraints of putting victims in the position they would have held had the violation not occurred. Distributive justice does not focus solely on the interests of the victim. Distributive justice is

¹⁵⁴ See Samantha Enslin-Payne, Tiger Brands Loses Market Share, *BUS. REPORT (NATIONAL)*, Feb. 21, 2011, at 19. Also available at <http://www.iol.co.za/business/companies/tiger-brands-loses-market-share-1.1029831>

¹⁵⁵ See Samantha Enslin-Payne, Tiger Brands Loses Market Share, *BUS. REPORT (NATIONAL)*, Feb. 21, 2011, at 19. Also available at <http://www.iol.co.za/business/companies/tiger-brands-loses-market-share-1.1029831>

flexible and bent towards a practical consideration of the impact of the remedy. It is relevant to situations that require a redistribution of resources, as is the case in South Africa.

I show that the Pioneer Foods settlement agreement was designed to address the negative impact of anticompetitive conduct. It provides for the opportunity to redress the anticompetitive environment created by long-running cartels and exclusionary conduct that may not be addressed solely by administrative penalties. I show that the remedies relate to the restoration of competition, deterrence, compensation, and disgorgement. The creation of the Agri-fund aims to lower the barriers to entry into the agro-processing industry, while the price reduction and capital expenditure terms seek to constrain Pioneer Foods, compensate, and disgorge some of its profits to the benefit of affected consumers and improve the competitive dynamics of the relevant markets. These remedies and the administrative penalty excluded the administrative penalty of about R196 million imposed by the Tribunal on Pioneer Foods in relation to Pioneer Foods' involvement in the bread cartel.

I also show that the anticompetitive effects of Pioneer Foods' conduct were clearly identified, and theories of harm emerged as a retrospective rationalization of different strategies adopted by Pioneer Foods that harmed consumers and competition: the cartel conduct maintained monopoly profits, and the exclusionary conduct, through predatory pricing, undermined entry. The identification of specific narratives of harm operated as limits to the identification of adequate remedies.

I discuss the key features that influenced the decision to settle for both the respondent firms and for the Commission. On one hand, there is a wide consensus that the saving of time and litigation costs are significant benefits of cartel settlements and that, for this reason, administrative penalties in settlements should generally be lower than fines. In addition, for a competition authority, freed up resources can be used to prosecute more cases. In this way, settlements can increase the *ex ante* deterrence effects. On the other hand, the argument against settlements is that, through a fine reduction, settlements can reduce deterrence. The design of a settlement agreement is fundamental for its success. South African jurisdiction is relatively new and immature when it comes to fining. The majority of fines are imposed by way of settlements, and the courts have not had many opportunities to decide on the matter. In this regard, perhaps the time has come for the Commission to adopt guidelines for fines.

Discount remedies are especially appropriate in developing countries such as South Africa. It is somewhat puzzling why before the Pioneer Foods settlement agreement a pure discount remedy had not been used in South Africa, especially given weak private enforcement of competition law. Like all remedies, a pure discount remedy raises its own problems. Perhaps a more serious

concern is that it is too modest a remedy. To fully deter misconduct, disgorgement of illicit profits must cover the total harm created by the conduct divided by the *ex ante* probability of detection and successful adjudication. Fully redressing cases where private enforcement of competition law is weak may require competition authorities to impose fines adequate to achieve optimal deterrence or at least reduce some of the shortfall in deterrence by depriving a firm violating competition law some of its illicit loot and at the same time compensating consumers for some of their losses.

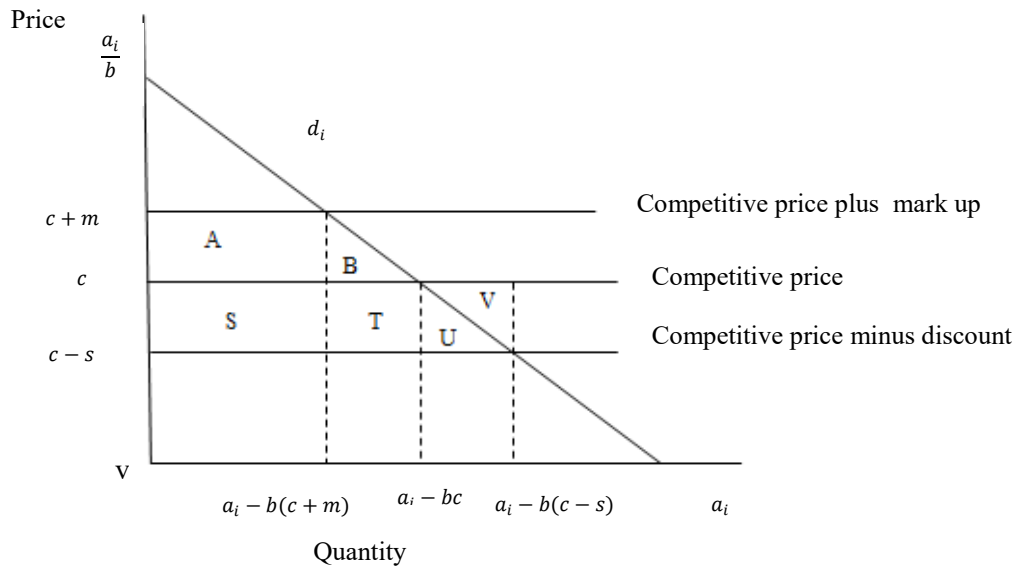
Overall, my discussion points to an important principle: the costs of remedies should not outweigh the consumer benefit they achieve. An important disagreement exists between those questioning the Pioneer Foods settlement agreement's validity and the Commission's authority to conclude it and others who advance the view that the Commission was within its right. We have no doubt that, regardless of the appropriateness, success, or failure of the remedial action in the Pioneer Foods settlement agreement or in general, the debate on competition law remedies is the next challenge of competition law scholarship.

C. Appendix

I. DISCOUNT REMEDIES AND ALLOCATIVE INEFFICIENCY

Following from Polinsky and Rubinfeld (2008)¹⁵⁶ suppose that a firm produces a homogenous good with constant marginal cost per unit. During the cartel period, the firm charges the monopoly price. Assume for simplicity that, after the cartel period, the competitive price will prevail, aside from the effect of any remedy. This might be the case because the price that would be paid in the absence of a discount is set by competitive firms who are not subject to any remedy. The consumption decision for a consumer in the cartel period is shown in Figure D-1.¹⁵⁷

Figure C-1 : The consumption decision for a consumer in a cartel period



Let c = constant marginal cost of production and m = price mark-up during the cartel period. The price during the cartel period is $c + m$, and the price thereafter would be c if there was no remedy. The static Nash equilibrium involves marginal cost pricing. After collusion all profits are competed away. Assume that the demand for the product is linear and stochastic. In each period a consumer may have “low” demand or “high” demand. The individual’s demand curve is

$$q = a_i - bP \quad (1)$$

¹⁵⁶ Polinsky and Rubinfeld (2003) in a working paper version of the 2008 article in the Journal of Industrial Economics compare the deadweight loss from coupon and discount remedies but because they are not aware of discount remedies in practice, they do not include in the final version of the Journal of industrial economics article references to discount remedies. They argue that they are not aware of any example wherein discount remedies were imposed by competition authorities.

¹⁵⁷ See also Polinsky and Rubinfeld (2008) and Bonakele and Mncube (2012).

where $i = H$ if demand is high and $i = L$ if demand is low ($a_H > a_L$). Assume demand is independent from period to period. Let θ = probability that demand is low. The population of consumers is normalized to be unity.¹⁵⁸ Consider the losses suffered by consumers during the cartel period. The loss of consumer surplus for a consumer whose demand $a_i - bP$ in the cartel period, due to the price mark-up, is the sum of the areas A and B in Figure 1 or

$$(a_i - b(c + m))m + \frac{1}{2}m^2 \quad (2)$$

Now suppose K = the expected consumer surplus loss during the cartel period.

$$K = \theta \left[(a_L - b(c + m))m + \frac{1}{2}bm^2 \right] + (1 - \theta) \left[(a_H - b(c + m))m + \frac{1}{2}bm^2 \right]$$

$$K = [\theta a_L + (1 - \theta)a_H]m - bcm - \frac{1}{2}bm^2 \quad (3)$$

Unlike Polinsky and Rubinfeld (2008), suppose that the discount remedy consists of allowing all consumers (whether harmed or not) to purchase as much of the good as they want at some price less than the competitive price c .¹⁵⁹

Discount remedies are over inclusive, some consumers who were not harmed will benefit from the discount. The assumption that consumers are made whole is applied on a class wide basis, and not an individual by individual basis. Let s = discount below the competitive price. Then the price in the remedy period is $c - s$. As shown Figure D-1, an individual with demand curve d_i in the remedy period will purchase $a_i - b(c - s)$ units of the good. The value of the discount remedy to this individual is the sum of the areas S, T, and U in Figure D-1, which equals $(a_i - bc)s + \frac{1}{2}bs^2$.

The expected value of the discount remedy to consumers, given the probability of demand being low or high, is

$$\theta[(a_L - bc)s + \frac{1}{2}bs^2] + (1 - \theta)[(a_H - bc)s + \frac{1}{2}bs^2] \quad (4)$$

Setting the expected value of the discount remedy to consumers, equation 4, to equal the expected consumer surplus loss during the cartel period, equation 3, and solving for s determines the discount that makes the class whole. The resulting quadratic equation in s is:

¹⁵⁸ Thus, we refer to an individual consumer and the class of consumers interchangeably.

¹⁵⁹ Polinsky and Rubinfeld (2008) assume that consumers who bought the good at the marked up price are given coupons equal to in number to the units of the good that they bought.

$$\frac{1}{2}bs^2 + [\theta a_L + (1 - \theta)a_H - bc]s - K = 0 \quad (5)$$

Therefore, the discount, s , that solves equation 5, is less than the mark-up in the cartel period m . Consumers buy more of the good at the discounted price than they did at the marked-up price. If the discount equalled the mark-up, consumers would gain more from the discount than the loss from the mark-up. In Figure D-1, the gain from the discount is the sum of the areas S, T, and U and the harm from the mark-up is the sum of the areas A and B. If s were to equal m , then S and A would be of identical size and T would exceed B. The gain would exceed the loss. To avoid overcompensating consumers, the discount s must be less than the mark-up m . Deadweight loss is a reduction in net economic benefits resulting from an inefficient allocation of resources. The deadweight loss of the discount remedy is shown in Figure D-1 as the loss corresponding to area V, which equals $\frac{1}{2}bs^2$ this loss is the same for individuals with low demand and high demand.

The implicit assumption in the analysis so far, is that a one remedy period is equal in length to the period during which the harm occurred. Now consider allowing the remedy to apply over multiple periods by assuming a lower discount for a longer period of time. One might expect that the present value of the deadweight loss would continue to decline as the number of remedy periods is increased, because a lower discount can be used. The present value of the deadweight loss of the discount remedy does decline as the number of remedy periods increases, but it does not go to zero. To be sure, suppose φ = discount below the competitive price when there are n remedy periods; d = time discount rate; $D = \frac{1}{1+d}$ and $\sum(n) = 1 + D + D^2 + \dots + D^n$. The benefit to consumers of a discount of magnitude φ for n periods is

$$\sum(n)\{\theta[(a_L - bc)\varphi + \frac{1}{2}b\varphi^2] + (1 + \theta)[a_H - bc]\varphi + \frac{1}{2}b\varphi^2\} \quad (6)$$

Setting equation 6, the present value of the stream of consumer surpluses for the n periods, equal to the harm during the cartel period equation 3 and solving for φ yields:

$$\varphi = \left[-\sum(n)(\theta a_L + (1 - \theta)a_H - bc) + \frac{(\sum(n)^2(\theta a_L + (1 - \theta)a_H - bc)^2 + 2\sum(n)bK)^{\frac{1}{2}}}{\sum(n)b} \right] \quad (7)$$

where K is defined by equation 3. The corresponding present value of the deadweight loss is

$$\frac{1}{2}\sum(n)b\varphi^2 \quad (8)$$

The limit of $\sum(n)$ is $1/(1 - D)$, which is positive and finite. It is then clear from equation 6 that the limit of φ must be positive; otherwise the benefit to consumers of the discount would go to zero and not make them whole. Hence, the limit of the deadweight loss equation 8 must be positive. It is thus not hard to imagine that it would be problematic to spread the discount over a

substantial period of time. First, a firm that is required to charge a price below its marginal cost for a lengthy period would eventually choose to exit the industry. Second, the longer the discount is applicable, the more difficult it becomes to determine the competitive price to which the discount should be applied. Obviously, both of these problems are lessened if the discount remedy is in effect for a relatively short period of time.

To demonstrate the practical relevance of the issues discussed above, a simulation exercise is insightful. I (arbitrarily) choose the following model parameters: $a_L = R\ 150$, $a_H = R\ 550$, $b = 5$, $c = R\ 5$, $m = 2$ and $\theta = 0.8$. Given these assumptions, for a one period remedy, the harm suffered by the class during the cartel period is R 400. To make the consumer class whole using a discount remedy in one period would require a discount of R1.9 which would result in a deadweight loss of R9.025. By changing θ from 0.8 to 0.3, the harm to the consumer class is R800. To make the consumer class whole using a discount remedy would require a discount of R1.95, which would result in a deadweight loss of R9.526 (see Table D-2). To illustrate the benefit of extending the discount remedy from one period to two periods, reconsider the example above and assume that the discount rate $D = 0.1$. If $\theta = 0.8$, the deadweight loss declines from R9.025 when there is one remedy period to R4.773 if there are two remedy periods. If $\theta = 0.3$, the deadweight loss declines from R9.526 to R4.975. Therefore, with multiple remedy periods, the allocative inefficiency of discount remedies diminishes.

Table C-1: Consumer harm, discount and deadweight loss

	<i>Consumer harm</i>	<i>Discount</i>	<i>Deadweight loss</i>
One remedy period			
$\theta = 0.8$	R 400	R 1.91	R 9.09
$\theta = 0.5$	R 640	R 1.94	R 9.41
$\theta = 0.3$	R 800	R 1.95	R 9.52
Two remedy period			
$\theta = 0.8$	R 400	R 0.99	R 4.75
$\theta = 0.5$	R 640	R 1.02	R 4.92
$\theta = 0.3$	R 800	R 1.02	R 4.98

Suppose further that the number of remedy periods increases from one to two. Let z = discount below the competitive price when there are two periods. The benefit to the class if the discount is z for two periods is

$$(1 + D)\left\{\theta \left[(a_L - bc)z + \frac{1}{2}bz^2\right] + (1 - \theta) \left[(a_H - bc)z + \frac{1}{2}bz^2\right]\right\} \quad (10)$$

And the associated deadweight loss is

$$\frac{1}{2}(1 + D)bz^2 \quad (11)$$

Setting equation 10 equal to equation 4 yields the following quadratic equation in z :

$$z^2 + 2 \left[\frac{\theta a_L + (1 - \theta)a_H - bc}{b} \right] z - 2[\theta a_L + (1 - \theta)a_H - bc]/(1 + D)b s - s^2/(1 + D) = 0$$

Two remedy periods will be preferred to one if and only if

$$(1 + D)z^2 < s^2 \quad (12)$$

V. ESSAY FIVE

SETTLING FOR A DISCOUNT: THE PIONEER FOODS PRICE REDUCTION REMEDY

1. Introduction

Following from the discussion in Essay four, competition policy remedies are interventions that aim to restore competition in the market place.¹⁶⁰ To achieve this, competition policy remedies bring to an end the anticompetitive conduct, disgorge illicit profits and/or compensate those who have suffered as a result of the anticompetitive conduct. In addition, competition policy remedies also place incentives to minimise the recurrence of the anticompetitive conduct. It is important to note, however, that restoring competition does not mean that competition policy remedies are aimed at achieving perfect competition in the market place (perfect competition only applies to a theoretical setting, where there are no barriers to entry, economic profits are competed away and is practically unattainable). Rather, competition policy remedies are aimed at restoring the market to conditions that would have existed in the absence of the anticompetitive conduct (commonly known as the ‘but for’ market conditions).

A discount remedy is an agreement between a competition authority and a firm that the firm will sell to all buyers at a given discount whether or not they were harmed by the conduct of the firm. The discount can be specified as either a certain specified amount or a percentage. A coupon discount remedy, on the other hand, is an agreement between a competition authority and a firm that the firm will sell at a discount only to holders of coupons.

One important question on the use of a discount remedy by a competition authority is whether this is beneficial to consumers? The answer appears obvious; a discount price reduction would be beneficial to all consumers, both the rich and the poor. Yet the extent of such a benefit could vary depending on a number of factors including: (1) the shape of the demand curve; (2) the presence of other competitors; (3) the value of the discount recipients have for the product; (4) the size of the discount; (5) the amount of discount issued; (6) the ability of sellers to selectively adjust price or quality; (7) the shape of the seller’s cost curve; and (8) the length of the discount period.

¹⁶⁰ See also Lianos and Economides (2010).

Perhaps this is why discount remedies while enormously powerful, are seldom used by competition authorities. To our knowledge, the Pioneer Foods discount remedy was the first of its kind in South Africa or elsewhere, although coupon discount remedies have been widely used in the US where many antitrust lawsuits involving price fixing have settled for coupon discount remedies and cash.¹⁶¹

Another reason could be the assumption that private actions provide adequate monetary relief, therefore discount remedies do not provide an additional benefit. For instance, when a cartel has harmed a customer, that customer may, under some circumstances, pursue a private damages claim for the purpose of litigation and/or settlement. The adequacy of the private actions assumption seems dubious, especially in South Africa, where private enforcement of competition law is weak.¹⁶²

Perhaps a more serious concern is that there is an open question as to whether the Commission has authority to conclude discount remedies.¹⁶³ The Commission has discretion in crafting appropriate remedies for competition law contraventions but this discretion has limits. During the Tribunal process of confirming the Pioneer Foods settlement agreement, the National Treasury Department (“National Treasury”) made an application to intervene.¹⁶⁴ According to the National Treasury, the only monetary sanction contemplated by the Competition Act is an administrative penalty. The National Treasury’s constitutional and statutory duty is to ensure that monies are properly transferred to and from the National Revenue Fund. Any fine imposed under the Competition Act is payable exclusively into the National Revenue Fund. The National Treasury argued during the confirmation proceedings that the Commission could not use its discretionary powers for a purpose not expressly authorised by the Competition Act, however laudable the intention. Furthermore, the National Treasury suggested that discount remedies are arguably an attempt to siphon off from the National Revenue Fund.

¹⁶¹ In the USA, coupon discount remedies have been widely used in many antitrust lawsuits involving price fixing. For example, in 1994, passengers who had travelled on major U.S. airlines between January 1988 and June 1992 received coupons with a total face value of approximately \$400 million (see also Polinsky and Rubinfeld (2008)). See also Appendix E for a selected summary of competition cases involving discount remedies broadly.

¹⁶² To the best of my knowledge, there has only been one private competition law damages claim in South Africa. Nationwide Airlines and Comair instituted civil claims in the High Court for damages arising out of the abuse of dominance by South African Airways..

¹⁶³ See article by Michael Bleby titled “Treasury tussle for Pioneer Food fine” on 25 November 2010 in Business Day newspaper. Also available at: <http://www.bdlive.co.za/articles/2010/11/25/treasury-tussle-for-pioneer-food-fine;jsessionid=72BEE8DDC7ABC7428A4B9A72A2EB389E.present1.bdfm>

¹⁶⁴ A party that has a direct and substantial interest in the confirmation proceedings of the Competition Tribunal can accordingly be joined as a party to the confirmation proceedings.

I evaluate the effectiveness of the Pioneer Foods discount remedy. I begin in section 2 by discussing as a matter of competition law, the foundations of imposing discount remedies. The Commission's discretion in crafting appropriate remedies is at the centre of my analysis. I argue that discount remedies are part of the exercise of discretionary remedialism. In section 3, I provide a brief discussion of the cartel conduct and then provide an overview of the choice and design of the Pioneer Foods discount remedy. In section 4, I evaluate the effect of imposing a discount remedy on one firm in an oligopoly market. To this end, I focus on the strategic interactions between the firms before, during and after the discount remedy. I find that the period before, during and after was characterised by increasing wheat prices. However, increasing wheat prices did not translate into increased bread prices during the discount remedy period. After the discount remedy period, prices of bread increased sharply. I conclude in section 5.

2. Discount remedies and competition law

The Commission has some discretion in crafting appropriate remedies for competition law contraventions. In the case of the Commission's settlement with Pioneer Foods, one such remedy was the discount remedy imposed on Pioneer Foods. Discretionary remedialism is the "view that courts (but in our case I could add competition authorities) have a discretion to award the 'appropriate' remedy in the circumstances of each individual case rather than being limited to specific (perhaps historically determined) remedies for each category of causative events" (see Lianos, 2011). A deep-rooted concern is discretionary remedialism could increase uncertainty and unpredictability as to the nature and form of the remedy. Uncertainty and unpredictability are certainly to be avoided with regard to the areas of law that rely on private governance (e.g. contracts, torts), where the aim is to facilitate the exercise of private choice in the most efficient way.

But, more provocatively, is predictability and certainty necessary to the same extent within a regime of public governance, such as competition law? For example, it is possible to argue that greater predictability of the competition law remedy might make it possible for the firm to calculate precisely the costs and benefits of the violation and therefore to make sure that the breach of competition law is profitable (Lianos, 2011).

Section 49 D (1) of the Competition Act provides that, if the Commission and a respondent "agree on the terms of an appropriate order," the Tribunal may confirm the agreement as a consent order. An "appropriate" consent order is one which is "suitable," that is, "suitable in the sense that it is an agreement that suits the contending interests of the Commission, as the proxy of

the public interest, and the respondent, and in that sense, can be appropriate as between themselves.” However, section 58 (1) (a) does not provide an exhaustive list of the kinds of orders that the Tribunal may make. Whatever remedy imposed must be “appropriate.” The principle of appropriateness constitutes an important limit to the Commission’s discretion in imposing remedies.

The Tribunal is required to be satisfied when confirming a consent and settlement agreement. This means that remedies agreed by the Commission and a respondent do not exceed the limits of what is appropriate and suitable. The Commission’s discretion in crafting remedies is very broad, allowing it to address various objectives of the Competition Act subject of course to the appropriateness test.¹⁶⁵ Essentially, the appropriateness test is an objective test and is thus justifiable. It does not state a list of appropriate remedies. Remedial discretion and the consequent unpredictability of the remedy are therefore tolerated, as long as it is within acceptable, from the point of view of appropriateness and suitability, limits.

Where conventional wisdom recognises that, because competition law cases involve market wide harm, they are uniquely suitable for class action treatments, a court could accept narrow arguments that in markets with product differentiation, buyer negotiation, or price discrimination, harm from anticompetitive conduct is individuated. By requiring precise calculations of the but-for price for each consumer class member, this narrow view imposes a higher burden of proof than would be imposed in an individual case, where proof of harm can be uncertain and any reasonable approximation of the amount of damages suffices. But the point for present purposes is not whether the narrow view on competition law class actions is right or wrong. The point is that the narrow view supports having competition authorities take up the slack left by the substantial barriers to competition law class actions by bringing out discount remedies from their remedial toolbox.

3. The Pioneer Foods discount remedy

An important precondition for a robust review of the Pioneer Foods discount remedy is a profound understanding of both the cartel agreement in general and the design of the discount remedy in particular. As a consequence, this section concentrates first on providing an overview

¹⁶⁵ South African competition law has a number of objectives including goals based on both economic welfare (promoting economic efficiency and consumer welfare) and non-economic welfare (fairness and the protection of a group of market participants, for example, small and medium-sized enterprises).

of the flour and bread cartels. Second, it gives a brief description of the design of the Pioneer Foods discount remedy.¹⁶⁶

A. THE FLOUR AND BREAD CARTELS

Section 4 (1) (b) of the Competition Act, 1998, as amended, provides that an agreement between, or concerted practice by, firms or a decision by an association of firms, is prohibited if it involves directly or indirectly fixing a purchase or selling price or any other trading condition or dividing markets by allocating customers, suppliers, territories, or specific types of goods or services.

There are four major firms that operate in the wheat milling industry in South Africa. These firms are Premier Foods, Tiger Brands, Pioneer Foods and Foodcorp. They are all vertically integrated and account for more than 90 per cent of the wheat milling market. They mill wheat into flour which is then used to supply both their own bakeries and independent third parties such as the chain stores and other bakeries. Up until the 1990s, the marketing of agricultural products in South Africa, including grain products, was extensively regulated by the state. In the 1996, the wheat industry was deregulated. In 2007, the Commission discovered that the four major wheat millers had continued, albeit privately, with regulating the industry. This conduct contravened Section 4 of the Competition Act, with respect to collusion involving flour and bread products.

When Premier Foods applied for and was granted corporate leniency in terms of the Commission's corporate leniency policy in the bread cartel case in March 2007, Premier Foods indicated that the cartel extended to the milling industry. Premier Foods' corporate leniency extended to its involvement in the milling cartels (milled white maize and milled flour products).¹⁶⁷ Tiger Brands corroborated Premier Foods' allegations and entered into a settlement agreement with the Commission on 9 November 2007.¹⁶⁸ In terms of the settlement agreement, the Tribunal imposed a fine of R98 million on Tiger Brands for its role in the bread cartel. Tiger Brands provided further evidence, not provided by Premier Foods on the operation of the milling cartels and applied for and was immunity from prosecution in terms of the corporate leniency policy for its involvement in the milling cartels.

On 6 January 2009, the Tribunal confirmed a settlement agreement between the Commission and Foodcorp regarding Foodcorp's involvement in the bread cartel and imposed a fine of R45

¹⁶⁶ Media release, 02 November 2010, Competition Commission settles with Pioneer Foods. Also available at <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Commission-settles-with-Pioneer-Foods2.pdf>

¹⁶⁷ Media Release, 14 February 2007, Competition commission prosecutes bread cartel. Available at: <http://www.compcom.co.za/2007-media-releases/>

¹⁶⁸ Press Statement, 12 November 2007, Tiger Brands admits to participation in bread and milling cartels and settles with Competition Commission. Available at: <http://www.compcom.co.za/2007-media-releases/>

million on Foodcorp.¹⁶⁹ On 3 February 2010, after contested proceedings, the Tribunal found that Pioneer Foods had been involved in a conspiracy to fix the prices of bread as well as market allocation in the Western Cape province and nationally. For this conduct, the Tribunal imposed a fine of R196 million on Pioneer Foods.

On 30 November 2010, the Tribunal confirmed a settlement agreement between the Commission and Pioneer Foods regarding Pioneer Foods' involvement in the milling cartels. The remedies that were confirmed in this settlement agreement heightened the debate about appropriate remedies. The remedies included, among others, (1) a fine of R500 million, part of which by agreement was set aside for the creation of an Agro-processing Competitiveness Fund ("Agri-fund"), (2) a commitment not to reduce capital expenditure, as well as, (3) a commitment to reduce prices on the sale of selected flour and bread products over an agreed period.

In sum, Premier Foods, Tiger Brands, Pioneer Foods and Foodcorp have all admitted that their conduct contravened section 4 (1) (b) of the Competition Act. They have admitted that during the period between 1999 and 2007, they were all part of a cartel that fixed selling prices, as well as the implementation dates of such prices, and allocated markets for flour and bread.

B. THE DESIGN OF THE DISCOUNT REMEDY

The Pioneer Foods price reduction commitment was essentially a discount remedy. It forced Pioneer Foods to offer a discount off the competitive price for all consumers of the selected flour and bread products, unlike a coupon discount remedy which awards only the harmed consumers with coupons that can be used to purchase the good at a price below that which would otherwise prevail. Put differently, Pioneer Foods agreed in November 2010 that it will, over a defined period, adjust its pricing in respect of certain flour products (white bread flour, brown bread flour and cake flour) and bread products (all standard 600g and 700g white and brown loaves accounting for around 85-90 per cent of Pioneer Food's bread sales).

The discount remedy was designed in such a way that the average realized gross profit for the selected bread and flour products over the base period would be compared with the average realized profit over the comparative period.¹⁷⁰ The base period was defined as the six month period from 1 October 2009 to 31 March 2010. The base period coincided with the period in

¹⁶⁹ Press release, 5 January 2009, Competition Commission settles with Foodcorp. Available at: <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/5-Jan-09-CC-Settles-with-Foodcorp.pdf>

¹⁷⁰ The Commission chose to call the discount remedy a "price reduction", while Pioneer Foods chose to call it a "margin reduction".

which the Commission had initiated and was investigating a further complaint against the four major millers of wheat. The complaint alleged that members of the National Chamber of Milling had engaged in anti-competitive exchange of commercially sensitive information and that this behaviour resulted in continued anticompetitive outcomes in flour and bread markets. The comparative period was defined as the period under review during the implementation of the discount remedy. The discount remedy amounted to a total price reduction of R160 million.¹⁷¹

The extent of the price reduction was adjusted to take into account: (1) increases in costs such as electricity and labour; (2) any difference in the gross profit over the comparative and base periods in respect of flour sold internally between Pioneer Foods' flour and baking operations (the intention was to maintain gross profit at the calculated base so that the gross margin reduction on vertically integrated flour and baking operations would be calculated at the level of bread); (3) as well as any difference in gross profit on all bran products sold for the comparative and base periods (so that revenue from bran as a by-product was in fact taken into account as a reduction in costs of flour production).

On one hand the price reduction was intended to benefit end consumers who had been subjected to anti-competitive prices over the years and on the other hand, to increase price competition in the markets for flour and bread products. Given the sensitive, commercial nature of information relating to Pioneer Foods' pricing, the exact duration as well as the expected average price reductions for each of the selected products was confidential and not known to the other market participants.¹⁷² Minimum levels of price reductions for each product category and the time period over which it will be implemented were set at a level so as to have a meaningful effect.¹⁷³ Furthermore, prices on certain products, with existing gross profit below a confidential minimum, would not be further reduced to avoid predatory outcomes.

To illustrate how the price reduction was calculated, suppose that the standard bread margin for the comparative period was R0.41 per loaf lower (R3.30 less R2.89) as shown in Table 5-1 (this equates to a 41 cents reduction in the price of bread). Suppose further that 391 million loaves of bread had been sold in the comparative period. This would result in the total price reduction of R160 million.

¹⁷¹ See Competition Commission and Pioneer (Consent Order), Case number: 15/CR/Mar10. Available at: <http://www.comptrib.co.za/assets/Uploads/1015CRM10-Pioneer.pdf>

¹⁷² The duration was for 6 months.

¹⁷³ The price of standard white and brown loaves of bread was to be reduced by an average minimum of 30 cents. This price reduction was to be in addition to any other promotional discount to retailers. The price of flour was to be reduced by an average minimum of R350 per tonne.

Table 5-1: Illustration of the calculation of the total price reduction

	Base period	Comparative period
	R per unit	R per unit
Total gross profit	2.56	2.1
Total damages and not assigned	-0.29	-0.24
Exclusion of overheads	1.03	1.03
Exclusion of overhead recovery	0.76	1.03
Increase 10% on fixed and variable cost	0.26	
Margin	3.30	2.89
Margin reduction ("comparative period" less "base period")		-0.41

Pioneer Foods accepted the risk of ensuring that the targeted price reduction was met over the comparative period. In the event that the price reductions exceeded the agreed target, Pioneer Foods accepted this risk and agreed that such a situation would not form a basis for any claim for a reduction in fine or other amounts payable in terms of the settlement agreement. Thus, the discount remedy was designed such that it was flexible, created uncertainty, and was not transparent to rivals. Furthermore, the Commission committed to monitoring compliance on the part of Pioneer Foods as well as monitoring the pass through on the part of major retailers.

4. Evaluating the effectiveness of discount remedy in the bread industry

While limited, the theoretical literature on discount remedies tends to focus on analytical studies of coupon discount remedies, providing counter-examples of the inefficiency of coupon discount remedies. Gramlich (1986) discusses several rationales for using coupon discounts rather than cash as a remedy. Gramlich (2003) evaluates how the form of the coupon discount remedy, whether it is a fixed discount, a percentage discount, or the right to buy at a fixed price affects the benefits obtained by consumers, the profits lost by the respondent, and the efficiency (total surplus) of the market when firms have market power.¹⁷⁴ Many commentators are generally highly critical of coupon discount remedies. They argue that coupon discount remedies facilitate settlements between the lawyers representing the class of consumers and the respondent that are not in the interests of the consumers. More generally, the lawyers' compensation is usually based on the value of the remedy to the class. According to Gramlich (1986), the average coupon discount redemption rate for consumer and corporate plaintiffs combined is 26.3 per cent. For consumer plaintiffs alone, it is 13.1 per cent. When the lawyers succeed, they are well rewarded,

¹⁷⁴ Miller and Singer (1997), and Leslie (2002) discuss also coupon discount remedies.

while the effective cost to the respondent of the settlement will be relatively low and consumers obtain a remedy that is of relatively little value.

In addition to the agency problems¹⁷⁵, coupon discount remedies suffer from two additional flaws. First, as emphasized in Borenstein (1996) in a model with imperfect competition, the coupon settlement will typically affect the future pricing behaviour of the respondents. Borenstein's main point can be illustrated in an example with undifferentiated Bertrand-style price competition. In the absence of coupons, the competitive price would settle at marginal cost and the defendants would make zero profits. If all consumers receive an abundant supply of coupons, the competitive price would be the marginal cost of production plus the face value of a coupon. At this price, firms earn zero profits. Note that the consumers are no better off with coupons than without: the competitive pricing has completely neutralized the effect of the coupons. With heterogeneous consumers, where some receive non-transferable coupons and others do not, consumers as a class do not benefit. The price of the product would rise to reflect that the coupon will be redeemed. Consumers who own the coupons will be better off than before while consumers who did not receive coupons will be worse off.

Polinsky and Rubinfeld (2008) focus on an important welfare distortion arising from coupon discount settlements. Consumers are heterogeneous in their model, with stochastic per period demand that is uncorrelated across periods. Through a coupon settlement, consumers receive coupons in proportion to their earlier purchases during the injury period. In this context, several situations can arise. Suppose a consumer who had low demand in the injury period (and hence a small number of coupons) ends up with high demand later. This consumer will use all of his or her coupons and will also purchase additional products at full price: the consumer's purchase level does not hinge on the coupon's value. Suppose instead that a consumer who had high demand in the injury period (and hence has many coupons) has low demand subsequently. For this consumer, the coupons will increase his purchase level since the marginal unit is now cheaper. A fundamental distortion can arise in this case, that is, the quantity that this consumer purchases may be inefficiently high in the sense that the marginal cost of the unit is higher than the intrinsic value that the consumer derives from its use.¹⁷⁶

¹⁷⁵ Also known as principal-agent problems, agency problems arise in situations where interests diverge. In other words, whenever the welfare of one party, termed the 'principal', depends upon actions taken by another party, termed the 'agent.' The problem lies in motivating the agent to act in the principal's interest rather than simply in the agent's own interest.

¹⁷⁶ Polinsky and Rubinfeld (2007) develop an argument for a hybrid remedy that includes the use of coupons giving consumers a choice between a cash amount and a certain number of coupons as a mechanism to facilitate the proper measurement of damages.

A. DISCOUNT REMEDIES AND COMPETITION

Suppose there are two classes of consumers. One class of consumers only buys standard bread and the other class of consumers only buys non-standard bread. Non-standard bread includes variety breads, generally perceived as higher in nutritional value than standard bread and is usually consumed by higher income or health-conscious individuals. Recall, that the Pioneer Foods discount remedy specifically excluded consumers who bought non-standard bread. Pioneer Foods was free to charge these consumers any price. Ignoring first of all, the strategic relations between firms, assume that the industry is characterised by monopolistic competition. Following Borenstein (1996) assume that the standard bread buyers' demand for bread is given by the proportion, $g(p)$ each period and is a given fraction, $1 - \sigma$, of the total demand the firm faces, $f(p)$ per period,

$$g(p) = (1 - \sigma)f(p) \quad \forall p \quad (1)$$

In the absence of the discount remedy, the firm (assumed to be Pioneer Foods) would want to charge standard bread buyers (the discount group) a higher price, paid by the non-discount group buyers. For simplicity, assume further that marginal costs are constant, c and where p_S and p_N represent the prices of standard bread and non-standard bread, respectively. If standard bread buyers receive a discount off the price of standard bread for one period, d , less than the price, the firm faces the following maximisation problem:

$$\text{Max } \pi = (p_N - c)\sigma f(p_N) + (p_S - c - d)(1 - \sigma)f(p_S - d) \quad (2)$$

First order conditions (p_N):

$$\sigma f(p_N) + (p_N - c)\sigma f'(p_N) = 0 \quad (3)$$

Thus

$$f(p_N) + (p_N - c)f'(p_N) = 0$$

First order conditions (p_S):

$$(1 - \sigma)f(p_S - d) + (p_S - c - d)(1 - \sigma)f'(p_S - d) = 0 \quad (4)$$

Thus

$$f(p_S - d) + (p_S - c - d)f'(p_S - d) = 0$$

If the profit function is globally concave in price, then $p = P^*$, so profits are increased by raising price from P^* . The incentives for the firm is to increase the price one group while reducing it for the other group. Note that the optimal price occurs where the weighted average of the first order condition for the non-discount buyers and the first order condition for the discount buyers is equal to zero. In the case of a linear demand function and constant marginal costs, the discount price would equal the price when there is no discount remedy in force.

The firm's incentive to change prices depends on a number of factors including the relationship between the costs of changing prices and the comparative loss in profits of maintaining prices. For example, the costs of changing prices might be higher than the comparative loss in profits from maintaining prices. To be specific to the Pioneer Foods example, the discount remedy was used in a setting where it was difficult to forecast the bread price, particularly because wheat costs change frequently. In this setting, the costs of changing prices are unlikely to prevent re-optimisation because the firm has to adjust prices frequently for other reasons. In addition, Pioneer Foods' could have perceived the discount to be not worth the concern of changing prices if for example, the discount group was small or the discount itself is small. While this may generally be true, however, with regards to Pioneer Foods and for bread alone the discount group accounted for between 85-90 per cent of bread sales.

The optimisation problem discussed above demonstrates the conclusion that the firm has the incentive to raise prices for the non-discount group of buyers and that these buyers are likely to bear most of the cost of a discount remedy. This conclusion is built on the assumption that the firm is a monopolist facing a relatively inelastic firm level demand curve. But does the result hold in more competitive markets? In more competitive markets, the argument that competition will prevent the firm from offsetting the discount by raising prices seems more appealing. This argument relies on the fact that strategic interactions could affect a firm's response to a discount remedy ignored in the just discussed example. Borenstein (1996) has considered the discount issue in the context of a symmetric differentiated duopoly setting. Following his analysis, assume:

$$Q_S = h(p_S, p_N), \quad Q_N = h(p_N, p_S), \quad c_S = c_N = c \quad (5)$$

Reaction functions are upward sloping in price. The Nash equilibrium price is, \tilde{P} , in the absence of the discount remedy. Suppose first that the discount remedy is then imposed on both firms. The new symmetric equilibrium price (P) and the discount price ($P - d$) will be such that $P - d < \tilde{P} < P$. Now suppose the discount remedy is imposed on firm 1, (assumed to be Pioneer Foods) and not on firm 2. Further for simplicity, suppose that firm 2 can either charge a single price or it

can match the terms of the discount remedy. If firm 2 chooses to match the terms of the discount remedy, then this situation corresponds to a situation in which the discount applies to both firms.

If firm 2 chooses to charge a single price to discount and non-discount buyers, firm 2's best response could be to increase or decrease that price from \tilde{P} or leave it unchanged depending on the weighted average of the slopes of the profit functions (\tilde{P}) it faces from the discount and non-discount buyers once firm 1 moves. On the other hand, if firm 2 chooses to price discriminate in favour of the discount buyers without matching the terms of the discount remedy, firm 1 prices are likely to be unaffected or only slightly affected by firm 2's response. In this situation, firm 2 would respond to firm 1's forced discount by lowering its own prices to the discount group and raising prices to the non-discount group. Firm 2's prices would still be lower than firm 1 and its discount would still be above that of firm 1. The above illustrations simply show that the direction of the net effect on price as a result of imposing a discount remedy on only one firm is at best ambiguous.

To illustrate the relevance of the issues discussed above, I compare the actual market situation during the period when the discount remedy was in place with the situation on the same market before and after. Using time series data on actual prices of bread sold in South Africa from a selected national retailers means that market characteristics such as the degree of competition, market structure, costs and demand characteristics are more comparable. The dataset contains information on monthly retail and wholesale bread prices from June 2010 to June 2013. The dataset is constructed using private data. The non-public data set typically has the advantage of providing richer and more detailed information. The non-public data is collected from selected retailers. Recall that the Commission undertook to monitor prices as a result of the Pioneer Foods discount remedy.¹⁷⁷ Included in the dataset is the cost of wheat which is exogenous to the conduct of the firms.¹⁷⁸ The following major retailers provided the Commission their monthly retail prices and the whole sale price with which they had bought the bread: (1) Pick n' Pay; (2) Woolworths; (3) Massmart; and (4) Shoprite.

During the discount remedy period, the Commission undertook a quasi-regulatory role by monitoring not only compliance on the part of Pioneer Foods but also monitoring of pass on effect of retailers. Generally, bread prices are viewed historically as being sticky downwards. For instance, one manager of Pioneer Foods' subsidiary division, Sasko, indicated in testimony to the

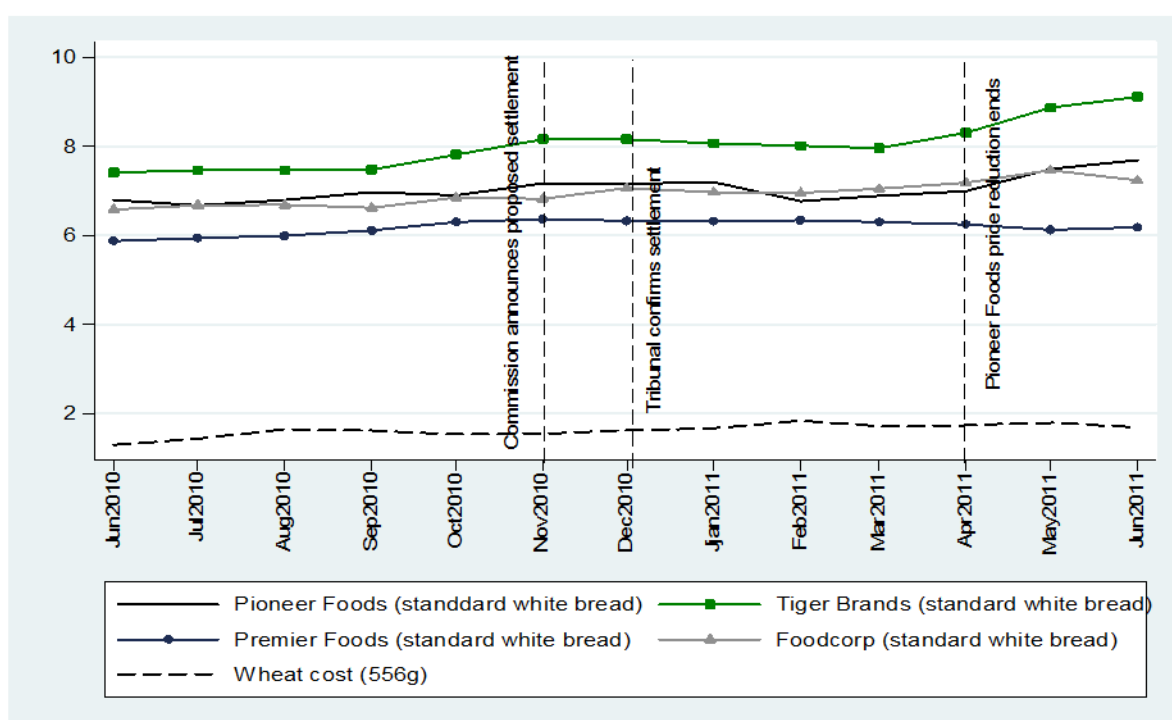
¹⁷⁷ Media Release, 14 December 2010, Pioneer implements agreement with Competition Commission to reduce the price of selected bread and flour products. Available at: <http://www.compcom.co.za/assets/Uploads/AttachedFiles/MyDocuments/Pioneer-media-release-14Dec10.pdf>

¹⁷⁸ The dataset includes monthly consumer price index data from Statistics South Africa ("Stats SA"). This data captures monthly food prices and is provided by the South African Grain Information Service ("SAGIS").

Tribunal as part of the bread cartel hearings that bread prices were never reduced when input costs declined because consumers apparently did not appreciate fluctuations in bread prices. Figures 5-1, 5-2 and 5-3 provide a comparison of Pioneer Foods' wholesale pricing and the wholesale pricing of its main rivals on standard white bread, standard brown bread and non-standard bread before, during and after the discount remedy. As shown in Figure 5-1 and 5-2, Pioneer Foods reduced its prices on standard white bread and brown bread during the discount remedy period. Tiger Brands and Premier Foods followed by either maintaining prices for both standard white bread and brown bread or reducing them slightly during the discount remedy. Foodcorp however, chose to increase its prices for standard brown bread while maintaining prices of standard white bread during the discount remedy period. After the discount remedy, Pioneer Foods and its rivals all increased their prices.

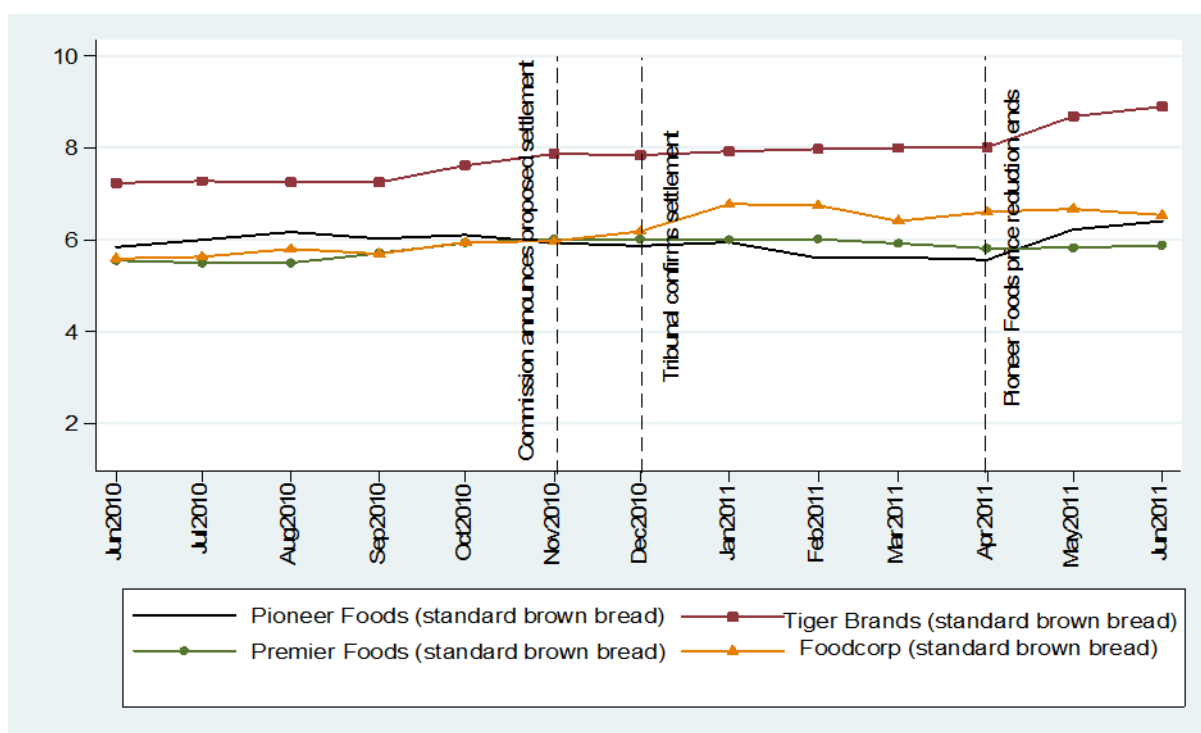
With regard to non-standard bread, Pioneer Foods increased the price faced by the non-standard bread customers during and after the discount remedy period (as shown in Figure 5-3). Tiger Brands and Premier Foods maintained prices during the remedy period while increasing them after the remedy period.

Figure 5-1: Average wholesale prices of standard white bread, 06/2010 -06/2011 (Rands)



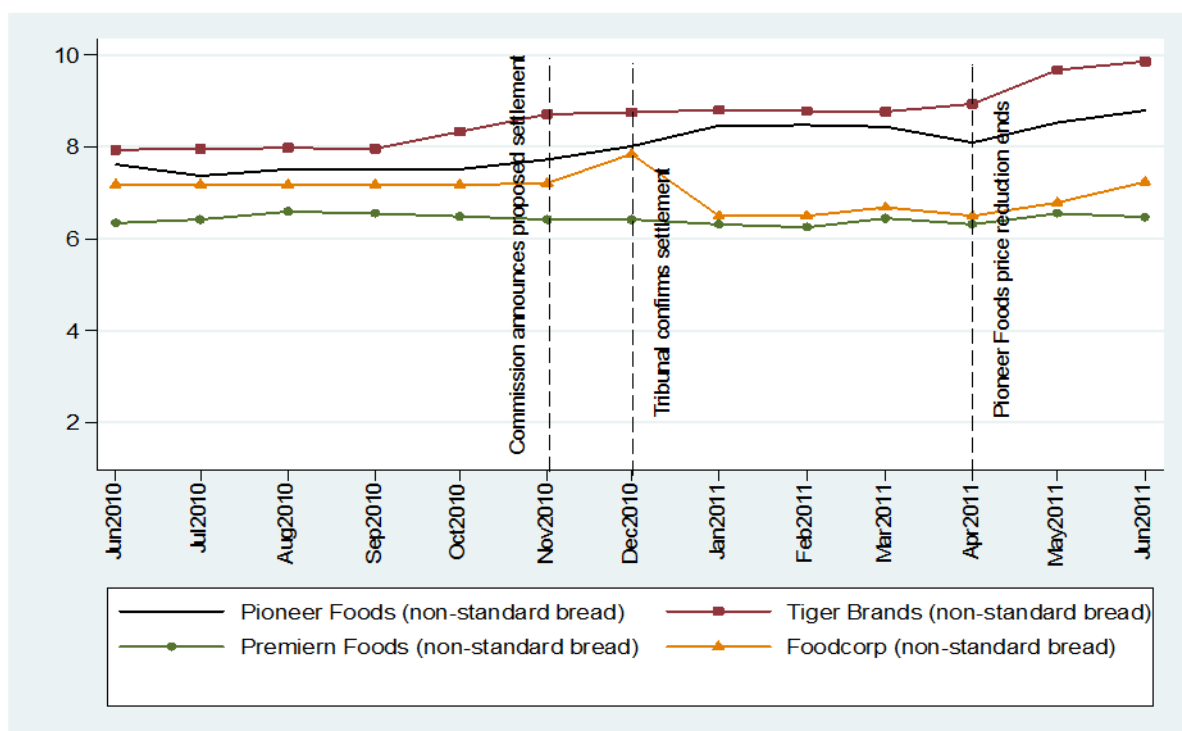
Source: Selected retail outlets and own calculations

Figure 5-2: Average wholesale prices of standard brown bread, 06/2010 -06/2011 (Rands)



Source: Selected retail outlets and own calculations

Figure 5-3: Average wholesale prices of non-standard bread, 06/2010 -06/2011 (Rands)



Source: Selected retail outlets and own calculations

While, the economic model presented above applies to individual firm decisions, I do not estimate firm-level models. For estimation purposes aggregate data is used. The approach adopted is the before-and-after method. Retail prices of standard white and brown bread before and after the end of the Pioneer Foods' discount remedy period are used to establish the appropriate benchmark retail prices within the discount remedy period had the discount remedy not been effected. The discount remedy operated from December 2010 to April 2011. This method is based on the idea that to the extent that discount remedy prices differ in a statistically significant way from the prices prior to the implementation of the discount remedy period and the prices once the discount remedy period ended, the difference could be attributed to the discount remedy.

In my model, the equilibrium price is a function of a supply-side factor (flour price) and a demand-side factor (price of substitute), both are expected to be positively related to equilibrium price. I implement the before-and-after approach within a multiple regression framework and include a dummy variable equal to 1 when the discount remedy was in effect and 0 otherwise. The coefficient on the dummy variable indicates whether the average price during the discount remedy period was significantly different and, in particular, lower than the average price during the non-discount remedy period. The model is expressed in its implicit form as:

$$\ln(\text{Retail bread price}) = \beta_0 + \beta_1 \ln(\text{flour price}) + \beta_2 \ln(\text{maize meal price}) + \beta_3(\text{discount remedy dummy}) + \varepsilon \quad (6)$$

I do not include the quantity variable itself as an independent variable but instrument quantity by using the price of substitutes (maize meal prices). This is done to avoid the inter-dependence of price and demand.¹⁷⁹ The cost and demand-shifters included are assumed to be exogenous, since they are presumed to be determined independently of price and therefore unaffected by price. The error term reflects random shifts in demand, cost, or conduct by the market participants. In addition, there are demand and cost shifters which are only observable to the firms. These unobservable characteristics will be captured by the error term in the empirical model.

Table 5-2 reports the estimation of the model for both the retail prices of standard white and brown bread. The table shows the estimation results for the case of the logarithm of the respective variables. It is revealed that the retail price difference between the discount remedy period and the non-discount remedy period for standard brown bread is $\exp(-0.0164) - 1 = -1.63$ per cent and is statistically significant. If I assume the average retail price of standard brown bread is R7.3 per loaf, the price reduction benefit is R 0.12 per loaf. For standard brown bread, while the discount remedy dummy variable is negative, it is not statistically significant. With respect to the

¹⁷⁹ From an econometric perspective, ignoring the interdependence can cause serious consequences in the form of biased coefficients.

relationship between the retail bread price and the flour price, the regression results reveal that a 1 per cent increase in the price of flour leads to a 0.499 per cent increase in the retail price of standard brown bread. For maize meal, I find that a price increase of 1 per cent leads to an increase in the retail price of standard brown bread of 0.081 per cent. Interestingly, while positive, the effect of maize meal price on bread price is not statistically significant.

Table 5-2 : Regression analysis

VARIABLES	(1) ln (std brown bread)	(2) ln (std white bread)
ln (flour)	0.499*** (0.126)	0.529*** (0.142)
ln (maize meal)	0.0812 (0.284)	0.0494 (0.311)
dummy remedy	-0.0164* (0.00895)	-0.00592 (0.0104)
Constant	0.825*** (0.243)	0.929*** (0.255)
Observations	13	13
R-squared	0.919	0.892

Robust standard errors in parentheses

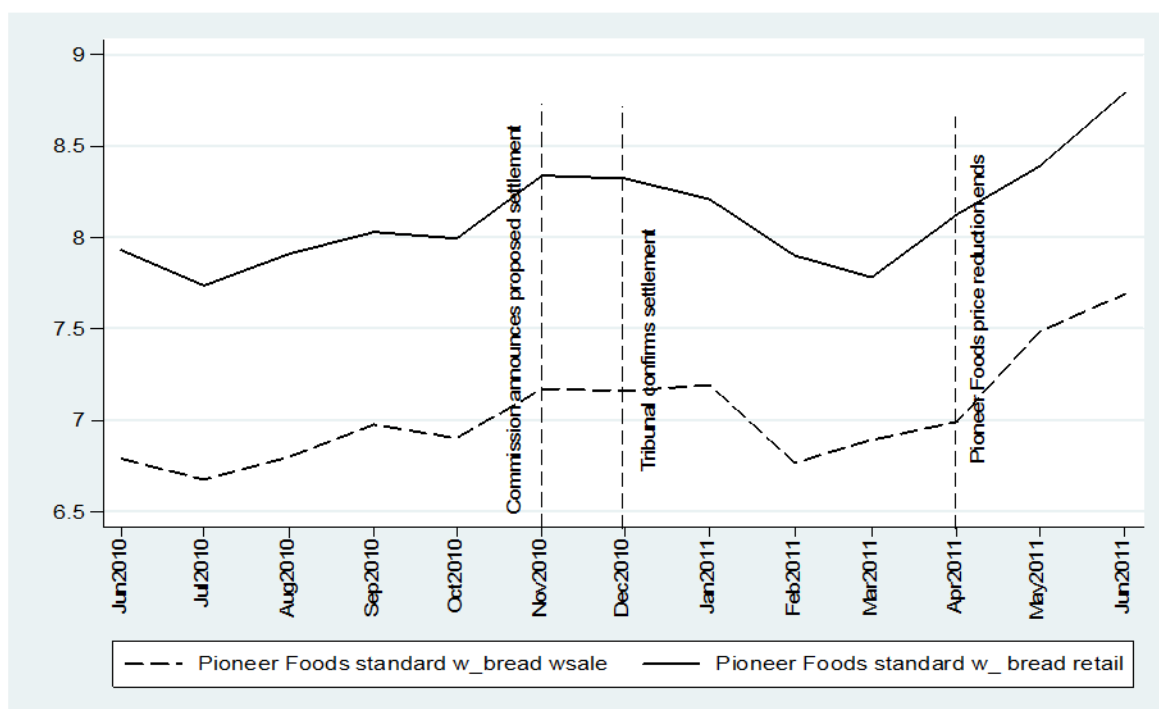
*** p<0.01, ** p<0.05, * p<0.1

Figures 5-4 and 5-5, show average wholesale and retail price for Pioneer Foods' standard white bread and brown bread before, during and after the discount remedy.¹⁸⁰ As shown, the retailers passed on the price reduction benefits from the Pioneer Foods discount remedy during the remedy period and increased the prices substantially after, following an increase in the wholesale price of standard bread. The Pioneer Foods discount remedy was aimed not at achieving price reduction benefits for the direct purchasers (retail outlets) of bread from the bread producers but rather at achieving price reduction benefits for indirect purchasers, that is, general consumers who buy bread from the retail outlets. For indirect purchasers, the price reduction benefit depends on the amount of price reduction retail outlets higher up in the distribution chain "pass on" to them. The analysis of the price reduction benefits from Pioneer Foods' discount remedy is especially difficult because the customer group targeted to recover these benefits consists of indirect purchasers. For example, while a lower price at the Pioneer Foods bread baking level may be expected to lead to lower prices at the retail level and ultimately lower prices to consumers, the extent to which a particular indirect purchaser benefits from the price reduction requires an analysis of the pass-on effect of the lower costs at each level in the supply chain.

¹⁸⁰ As shown in the table, there are only 13 observations, this introduces sample size problems which may bias the results.

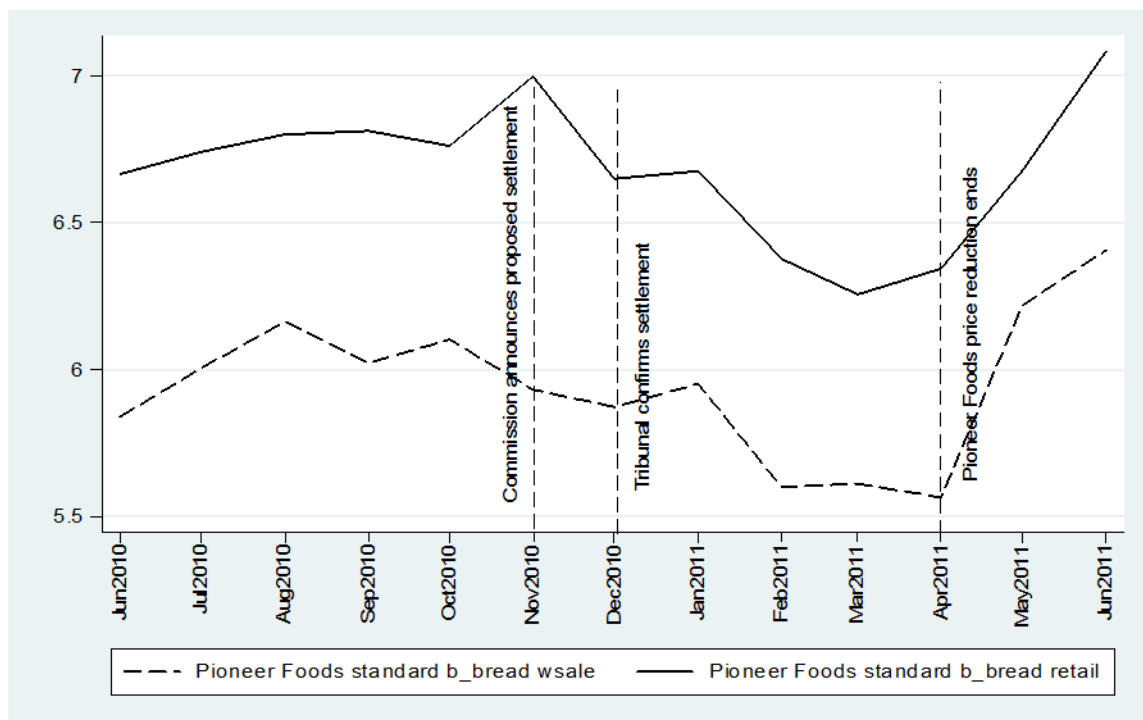
Adding to the complexity of the indirect purchaser analysis is the fact that there may be multiple supply chains. To illustrate, Pioneer Foods might sell directly to some retailers and indirectly to others. Alternatively, an analysis of pass-on effect along the supply chain will depend at each step on the extent to which the relevant market or markets are or are not competitive, and if not competitive, the nature of the strategic interaction among the competitors. These complicating factors increase the likelihood that the price reduction benefits to be recovered by downstream customers will vary from individual to individual.

Figure 5-4: Average wholesale and retail prices for Pioneer Foods' standard white bread, 06/2010 -06/2011



Source: Selected retail outlets and own calculations

Figure 5-5: Average wholesale and retail prices for Pioneer Foods' standard brown bread, 06/2010 -06/2011



Source: Selected retail outlets and own calculations

5. Conclusion

Discount remedies are especially appropriate in developing countries such as South Africa. The Pioneer Foods discount remedy was designed to address the negative impact of anticompetitive conduct:

- The discount remedy was amounted to a total price reduction of R160 million;
- It was applied to selected flour and bread products;
- Certain products with existing low margins were excluded; and
- The discount remedy only applied to one firm; and

The discount remedy provided for an opportunity to redress the anticompetitive environment created by long-running bread and flour cartels that may not be addressed solely by administrative penalties (see Bonakele and Mncube (2012)). The discount remedy sought to constrain Pioneer Foods, compensate, and disgorge some of its profits to the benefit of affected consumers and improve the competitive dynamics of the relevant markets. The Pioneer Foods discount remedy constitutes a key measure of 'success' for the cartel case (s).

South Africa is a net importer of wheat. Prior to the implementation of the Pioneer Foods discount remedy, the wheat price had been increasing steadily impacting on the price of flour and bread. During the discount remedy period, wheat prices continued to show an upward trajectory. This, however, was not translated into increased bread prices. South Africa was shielded from higher bread prices, in part because of the Pioneer Foods discount remedy, albeit temporarily during the discount remedy period. After the discount remedy period, prices of bread increased sharply. Note as well that the cartel price increasing effects identified in Essay 3 relate to different time period and are not in tension with this conclusion of the considerable success of the discount remedy during the remedy period.

Still, for many, qualms will remain about allowing competition authorities to use discount remedies for competition law violations. But the deeper source of those qualms is not really that alternative remedies are better placed. Instead, the qualms are more about whether competition authorities and firms might abuse discount remedies rather than employ them optimally. Furthermore, the qualms represent some underlying insecurity about whether discount remedies are really permissible in competition law. Indeed, the National Treasury made an application to intervene in the Tribunal questioning the Pioneer Foods settlement agreement's validity and the Commission's authority to conclude it. Be that as it may, there are, of course, different choices that can be made and combined in order to affect the incentives of firms and restore the best possible outcome for competition in specific relevant markets.¹⁸¹

¹⁸¹ For example, one could develop remedies that affect the discretion of firms to run their business. In other words, develop remedies that affect their autonomy as market participants and consequently their incentives. This could be conceived as a continuum ranging from preserving some degree of discretion for the firms (in the case of contractual remedies, such as price reduction commitments) to purely non- voluntary schemes, unilaterally imposed by the Competition Authorities.

D. Appendix

I. SELECTED COUPON DISCOUNT SETTLEMENTS

Table D-1: Selected coupon and pure discount settlements following cartel allegations

Country	Year settled	Case	Damages group	Settlement	Value of discount/coupon (US\$M)	Redemption period	Definition
USA	1986	North Atlantic Air Travel	Firms & Consumers	coupon	30	5 years	fixed \$ off
USA	1990	Superior Containers	Firms	cash & coupon	70	3 months	fixed \$ off
USA	1992	Bulk Popcorn	Firms	cash & coupon	4	1 year	fixed \$ off
USA	1994	Domestic Air Transport	Consumers	cash & coupon	408	3 years	fixed \$ off
USA	1998	Residential Doors	Firms	cash & coupon	2	15 months	fixed \$ off
USA	2000	Motorsports Merchandise	Consumers	cash & coupon	6	until 93% redeemed	percentage & fixed
USA	2000	Commercial Tissue	Firms & Consumers	cash & coupon	36	1 year	fixed \$ off

VI. CONCLUSION

South African competition authorities are subject to two types of constraints: (1) limited resources and (2) imperfect information. Limited resources constrain, for example, the Commission's ability to monitor all the markets and investigate all the firms suspected of engaging in anticompetitive conduct including colluding. The second constraint relates to the fact that the Commission cannot perfectly observe the characteristics and behaviour of the firms. This asymmetry of information is the source of adverse selection and moral hazard problems that reduce the Commission's efficiency and impact. Given the limitations faced by competition authorities, concerns about the relationship between the errors and the enforcement of competition rules has been a mainstream consideration in competition policy discourse in last 2 decades.¹⁸²

In light of the above and to improve decision making, the error-cost framework is an important innovation in this regard. The framework makes the following assumptions: First, both Type I (false positive, where innocent firms are sanctioned or subject to significant costs imposed by investigations and litigation) and Type II (false negative, where violators are not sanctioned) errors are inevitable in competition law cases because of difficulties in distinguishing pro-competitive business practices from anticompetitive behaviour. Second, the social costs associated with Type I errors are generally greater than the social costs of Type II errors because market forces can be expected to offer some correction with respect of Type II errors. Third, optimal competition policy rules will minimise the expected sum of errors costs subject to the constraint that the rules be relatively simple and reasonable administrable. As a result, the error cost framework gives rise to a number of simple filters that can be used to minimise error costs. This framework is similar to a Bayesian decision making framework which addresses problems of decision making under uncertainty.¹⁸³

According to Kaplow (2011), to determine an optimal regime for enforcing the rule against collusion requires attention to three factors: (1) the social objective, (2) the problem of detection and (3) the design of appropriate remedies. In South Africa, the purpose of the rule prohibiting firms from entering into agreements not to compete with one another is to deter such behaviour. This arises from concerns about the static effects such as allocative inefficiency and transfers

¹⁸² This follows the influential contribution by Easterbrook (1986) on this subject.

¹⁸³ Applying the Bayesian approach, the competition authority holds an earlier belief about the likelihood that a particular business practice is anticompetitive. With case specific information or new evidence as the theoretical and empirical understanding of the practices evolves, earlier beliefs are updated. The optimal decision rule is then based on new, updated likelihood that the practice will be anticompetitive by minimising a loss function measuring the social cost of Type I and Type II errors.

from consumers to producers as well as the dynamic effects such as inducing excessive entry in homogeneous goods industries. In other words, suppose firms have engaged in collusive behaviour, the primary benefit for enforcing the rule against collusion is deterrence. This means that the social benefit is from collusion occurring less often. The prospect of remedies will also deter collusion. Therefore, the social cost of false negatives is in the loss of deterrence. On the other hand, suppose the rule against collusion is enforced on firms that have not engaged in collusive behaviour. In this situation, sanctions imposed may chill beneficial business practices because firms anticipate that their conduct may generate a substantial risk of false positives.

While detection of successful collusion is inevitable imperfect, there are a number ways to detect collusion and these should be ideally considered in combination. For example, collusion could be detected through corporate leniency programmes and market based evidence, notably pricing patterns, the use of facilitating practices and market structure factors. However, because of difficulties with detecting collusion, it is not easy to achieve effective deterrence, even in the presence of tough enforcement in terms of both overall effort and the level of sanctions.

The analysis of competition law remedies generally focuses on fines because monetary sanctions are mostly used. They also tend to be the most efficient sanction to the extent feasible subject to the limit of a firm's assets. In order to deter collusion, remedies should reflect harm. Competition law remedies in South Africa do not reflect this prescription very well.¹⁸⁴ The Competition Amendment Act introduces imprisonment as a helpful supplement in achieving deterrence.¹⁸⁵

There are a number of lessons to draw from this study. First, consider the potential consumer welfare effects of collusion. The cartels significantly raised prices for several years. These price increases were on staple foods (maize meal and bread as well as wheat flour, a key input to bread) which means that poor consumers were hurt the most. This clearly undermined the food security and threatened the livelihoods of the most vulnerable by eroding their already limited purchasing power.

The quantification of cartel overcharges may be required in both public and private enforcement of competition laws. In public enforcement, cartel overcharges may be quantified as part of the decision by a competition authority what fine to impose. In private enforcement, the quantification of cartel overcharges is the central issue to a damages claim. It is impossible to

¹⁸⁴ For instance, collusion cases that exhibit small price elevations are more likely to involve false positives and thus generate chilling costs, and hence moderating expected sanctions is valuable and less social cost from forgone deterrence results.

¹⁸⁵ However, the imprisonment of individuals found in violation of the rule against collusion is also socially costly. Resources are consumed in running the system. There is also an open question as to whether the loss to imprisoned individuals is matched by any direct social offset.

know with certainty how for example the flour market would have evolved in the absence of the collusive behaviour. Therefore, the calculation of overcharges is subject to considerable limits as to the degree of certainty and precision. There is no a single 'true' value of the overcharge suffered that can be determined, but only best estimates relying on assumptions and approximations. While admittedly, estimations of overcharges are subject to assumptions. However, that the estimation methods are imperfect is however not a reason to discard them. Best practice suggests that whenever used, one should assess the results of each approach in light of its limitation, perform a sensitivity analysis to assess the robustness of the results and reconcile with more direct evidence available (for instance, internal documents of the cartelists on agreed price increases).

The cartel cases in the grain industry give us several insights into firm behaviour and follow-on policy implications. Access to markets is actively limited by the cartels (or at least such attempts are made through strategic behaviour), using artificial barriers. Cartels need to exclude entrants simple because firms who face numerous rivals are constrained in their incentive and ability to coordinate. Historically, cartels have used a variety of different techniques to block entry. These include the threat of predatory price wars. The story behind predatory pricing by a cartel is that a new entrant decides to enter and gain market share by undercutting the cartel pricing equilibrium. Either all firms together or a few alone respond by engaging in a price war until the new entrant relents and is either accommodated into the cartel or exits. Generally, in oligopoly industries raising prices after a predatory price war does not only require discouraging entry, but also requires discouraging competition from other competitors.

This study shows that cartel investigations do not discuss whether the cartel engaged in activities to block entry because such evidence is not necessary for conviction, especially so in South Africa where price fixing is *per se* illegal. But undermining barriers, especially those erected by cartels is an important part of competition policy.

In addition, this study shows that significant industry restructuring (such as the liberalisation, ushered in by the first democratic government) led to the break-up of regulated cartels, yet there was no attempt or provision actively monitor and to see if competition was being preserved post the restructuring. Liberalisation alone, without vigorous anti-cartel enforcement, may give rise to increasing cartel activity rather than competition. In the grain industry, liberalisation may have inadvertently, by increasing competition in formerly protected markets, increased the incentives for firms to participate in cartels.

Since its adoption, the CLP has proved a formidable tool for cartel detection. The uncovering of the bread, flour and maize meal cartels through the CLP illustrates that the detection of one cartel may often lead to the detection of other cartels. Yet, the greatest challenge for the CLP will be the introduction of criminal sanctions pursuant to the Competition Amendment Act. Provision is also made for the Commission to certify firms and individuals subject to criminal liability as deserving of leniency. The Commission may also make submissions to the National Prosecuting Authority (“NPA”), however, the NPA will have the responsibility for prosecuting individuals committing a criminal offence under the Competition Amendment Act and may or may not support the granting of leniency. The Competition Amendment Act will create a new legal environment for cartel enforcement through the co-existence of a criminal law regime and a civil law regime.

This poses important questions for the future. Will criminalisation have an adverse effect on the CLP? How much of what types of evidence in various contexts will be sufficient for a finding of liability? But as in any discussion of collusion, it is easier to ask questions than to find answers. Perhaps it is time for a wholesale rethinking. No doubt future studies of collusive behaviour may have many explanations and many distinct outcomes. This study seeks to provide a systematic, ground up and case study driven analysis of collusion and to advance our understanding on many subsidiary questions on collusion in South Africa to the extent possible.

In summary, to understand collusion, economics offers a standard model. According to the standard model, the goal of a cartel is to raise prices, determine output and maximise joint profits for the cartel members. While industry profits may be maximised by adherence to the cartel agreement, individual firms have an incentive to cheat because individual firm profits may be maximised by cheating. Consequently, to be effective the cartel must have a credible punishment mechanism to timely detect and punish cheating cartel members. But when collusive agreements are examined in detail as has been done in this study, it is without doubt that collusive agreements do not always conform to the standard textbook or even sophisticated game theoretic models. This fact complicates the task of competition authorities and muddies both legal and economic theory. However, it clearly illustrates why a case by case analysis is indispensable to our understanding of collusion.

VII. REFERENCES

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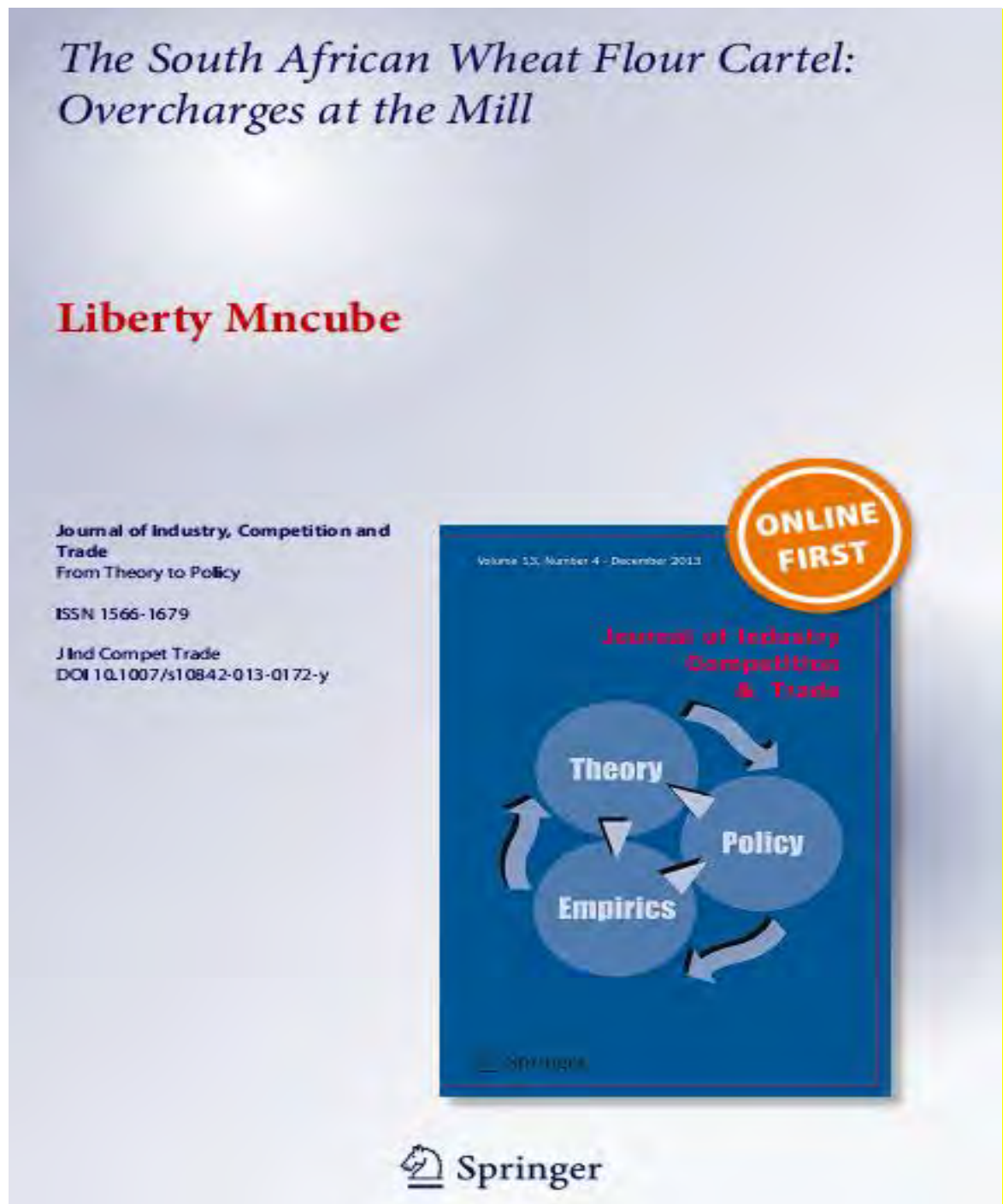
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VIII. REFEREED JOURNAL TABLES OF CONTENTS FOR ALL THE PUBLISHED ESSAYS DURING THE COURSE OF THE STUDY

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2. ESSAY TWO – Published in the Journal for Studies in Economics and Econometrics.



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